







From LIEUT COLONEL A. P PHAYRE, C B., *Chief Commissioner of British Burma and Agent to the Govr. Genl, To the Secy. to the Govt. of India, Foreign Dept.*,—No. 176, dated Rangoon, 10th August 1865.

With my letter No 168, dated the 5th of August 1864, I had the honor to submit a proposition for an expedition to be formed to explore the upper course of the River Salween. Sanction to this plan was conveyed to me by your letter No 404, dated the 22nd of August last. In pursuance of that sanction, Captain C E Watson, of the Royal Artillery (Madras), Assistant Commissioner, British Burma, and Mr Francis Fedden, Assistant in the Geological Survey of India, were appointed to carry out the objects in view. I have now the honor to submit the results of their expedition as follows —

1st — Journal of Captain C. E. Watson

2nd — Report on the navigability of the Salween River by Mr F Fedden, with Meteorological Tables and observations for latitude, &c

3rd — Map by Mr F. Fedden, showing the route taken by the travellers.

2 It is well known that the Salween River, about 80 miles above Maulmain, is barred by rocks and rapids which prevent navigation. From that point the British territory extends about 80 or 90 miles further north on the western bank, and within that territory the River Salween is still unsuited for navigation. The object of the expedition was to ascertain whether, beyond British territory for 3 or 400 miles, the river was navigable or not, for on this point there was no trustworthy information. If the Salween River had been found to be navigable for steamers for 3 or 400 miles above British territory, it then would have remained to be considered, *first*, whether the course of the river within British territory might be improved, or the passage upwards of steamers into the river beyond the great rocky barrier be otherwise rendered practicable, or, *second*, whether the open portion of the river in its upper course might be navigated by steamers, and the southernmost point to which they could reach be connected by a road with the clear channel below the great barrier, from whence the navigation to Maulmain is easy.

3 There is no question but that the opening of the Salween River to steamers would be an event of great importance to commerce, for the river passes through countries inhabited by Shans, an energetic and industrious people, and it flows also through the western portion of the Chinese province of Yunan. But the survey has clearly shown that the upper portion of the Salween River is so frequently interrupted by rocks and rapids that it is not navigable.



JOURNAL OF CAPTAIN C E WATSON  
THE SALWEEN EXPEDITION  
SEASON OF 1861-65.

We left Shwé Gyeen on the 21st November, and arrived at Toungoo on the 29th, distance 86 miles

This road is so well known, that no particular description seems needed. It may, however, be remarked, that by constructing rude bridges of material obtainable on the spot, and by occasionally turning the road round swamps, the land route between Shwé Gyeen and Toungoo might be made practicable for carts during seven months of the year. On the road met several parties of Shans with ponies and bullocks, the latter laden chiefly with stick-lac and kyantaga (coarse sugar) on their way to Rangoon and Mandalay. Halted at Toungoo from the 30th November to the 5th December, waiting for the mail and a second pass from the Mandalay Comt.

*December 5th, Monday.*—Left Toungoo and marched to Lay-dounggan, distance 8 miles. There is a good wooden zayat at the halting place. The water from the tank is indifferent. Road for first 3 miles very swampy. For the next 3 miles passed through paddy-fields, along the bank of a stream, by means of which the surrounding cultivation is irrigated. After passing through a small patch of jungle, reached another extensive paddy plain on the extremity of which was the halting place.

*December 6th, Tuesday*—To Toung-nyo, distance 10 miles. Road good the whole way. Passed Nat-yay-dwen at 6 miles. Here there are good zayats and water. Ditto at Shwé kyay-yeet, 2 miles further on. Halted at the head quarters of a Thoogyee. Here the zayats and water are very bad.

*December 7th, Wednesday*—Marched to Thagarah, distance 12 miles. There is no good halting place on the road, except at the crossing of the Tswa Choung, about half-way. Road very sandy, but good, though the walking was heavy. Met several carts from Yemathin and Ningyan, very lightly laden with tobacco, onions, &c. Many were drawn by six bullocks. I was informed that as no bullocks were allowed to be taken from Burmah Proper to Toungoo for sale, the people adopted the device of taking down six bullocks to each cart, and returning with only two.

*December 8th, Thursday.*—To Myo-hla, our frontier village on the Sittang (or, as it is there called, Poung-loung stream), distance 8 miles. Road very good the whole distance, at this village are stationed 30 Policemen under a Head Constable. They live in a small bamboo stockade, about 50 yards from the river bank. The houses, inside, are all thatched, and as the stockade itself is constructed of highly inflammable materials, a

December 21st, Wednesday — Received a visit from the Tseethai and other officials. Was informed that the Officer sent from Mandalay to accompany us had not yet arrived, but that he was expected daily. Shortly after the Tseetkai took his departure that Officer, whose Burmese title is Nakan, made his appearance. He said that he had just arrived, though, from what I previously heard, I believe that he was here two days ago. He is an old Shan, apparently upwards of 60 years of age. A few years ago he acted for a short time as Nakan at Monai, the capital of the Shan States. In the evening the Tseetkai sent over a broker to arrange about the bullocks we require for carriage. Finding that it is preferable to hire than to purchase it is agreed that to-morrow the owners shall attend at the Tseetkai's house to sign the agreement we may then make.

December 22nd Thursday — Drew out the agreement for the hire of 20 bullocks at the rate of Rs. 20 each for the trip to Thennuee, and Rs. 50 for the drivers. The Tseetkai kindly consented to stand security for the correct fulfilment of the contract.

December 23rd, Friday — Accompanied the Tseetkai to the Shwé-hmin in Pagoda which is situated on a high hill about 5 miles to the east of the town. A fine view is here obtained of the surrounding country. As far as the eye can reach, north and south, appears one enormous plain extensively cultivated. To the westward at a distance of 30 or 40 miles, is seen a low range of hills beyond which flows the Irrawaddy. To the east lies a range of hills that preserve a tolerable uniform direction of N and S, from Lat 18 to Lat 22 N. The highest point of the range visible from here is not more, I think, than 2,000 feet above sea level.

December 24th, Saturday — Took a walk round the town, closed by a massive parapet of earth, or rather the remains of what was a parapet. The old ditch is clearly traced round in some places is full of water. The houses in the town are inferior description and not to be compared with those at the Phoongyee houses and zayuts outside are very numerously built. There are also some handsome bridges across the ditch. There are many large masonry tanks containing water in the vicinity of the chief Phoongyee houses. The town is the same size as Ning yan (1 mile square), but in the neighbourhood are several large villages. To the south of the large tank called Kyee nee-gan. It is about 2½ miles in breadth. At all seasons of the year it is covered with fowl. I have never seen snipe so numerous as they were of this lake. During my stay I had some capital shooting accompanied twice by the Tseetkai but as he did not attempt "flying" of course he did not add much to the bag. Since entering this territory I have seen and heard many things that induce me to believe that the people of all the districts we have passed through

rule, in any thing but prosperous circumstances, with which articles of food are raised, and the people enjoy here from the destruction of their crops, can only be ascribed to misgovernment. The agricultural classes in the parts of British Burma where the sun is always productive live in a much greater state of ease and comfort than do the agricultural classes in the best districts of Burma Proper. These remarks equally apply to that part of the country I passed through last year on my way to and from Mandalay. The imperial taxes that the people pay are, 1st, a poll tax of 3 tickals of silver (equal to about 4½ Rupees in our coin), 2nd, a land tax, assessed at  $\frac{1}{10}$ th of the value of the crops. These taxes do not appear to be excessive, but when it is considered that a number of officials, great and small, live entirely on what they can screw out of the people, it is not to be wondered that complaints are made of over-taxation. Most Burmese officials, on their Chiefs being removed, are liable to lose their appointments. Their tenure of office being so uncertain, they take good care to "make hay whilst the sun shines."

*December 25th, Sunday*—Received a letter from Dr. Williams, the Chief Commissioner's Agent at Mandalay. He states that there are serious disturbances in the Theinnee district, and that troops have been sent there from Mandalay.

*December 26th, Monday*—The Tseetkai left this day for the town of Pindalai to meet the Kai Won (the chief official of the districts south of Mandalay).

*December 28th, Wednesday*—The second pass from Mandalay arrived to-day, so we are determined to start off on the 30th.

*December 29th, Thursday*—Our bullocks arrived to-day, and we were busy all day in arranging their loads. I may here mention that a box larger than a 1-dozen case cannot be slung on a bullock. On level ground bullocks will carry a weight of 80 lbs., but over hilly ground a weight of 50 or 60 lbs is considered sufficient.

*December 30th, Friday*.—Marched to Thayet-myung, distance 10 miles. For the first three miles passed along paddy-fields to the large village of Tsein-gone, inhabited mostly by Shans. This is a great emporium for bullocks, and ours were from this village. The remainder of the road passed over sandy and rocky ground, the cultivation consisting

\* (Hill clearings) of two or three small Toungyas\* Having winded for 3 miles into the hills, we encamped on a small stream where there is a comfortable zayat. No view is obtained from here, the hills closing in on all sides.

*December 31st, Saturday*.—At starting ascended a very steep range of hills, the highest point where there is an encamping ground being 2,000 feet above sea level. Here met 100 bullocks from the Nyoung Yooay and Laugyah districts, on their way south, laden with stick-lac,

ground nuts, kyan taga sweetmeats &c. Also passed 50 bullocks laden with salt and ngapee returning from Magway on the Irrawaddy (Magway lies about 50 miles to the east of Bhamo and there is a good cart road between the two towns). From the summit of the range the ground gently undulated. After descending about 500 feet in a distance of 5 miles, halted at the village of Nankwai, distance 8 miles.

*January 1st 1860, Sunday* —Halt. Jungle fowl more plentiful here than I have ever before seen them. We have shot nearly 10 brace since arrival. Thermometer at noon only 69° At 6 a.m. at 45°

*January 2nd, Monday* —Road very hilly. In many places blocked up by the overhanging branches of trees under which the bullocks passed with ease, but which we were obliged to clear away for the elephants. Met numbers of Shans, their women and children on their way to the Rangoon Pagoda. I think that few of these families intend to return. Passed 80 bullocks on their way to Toungoo. Encamped on the top of a high hill at a teakan called Nyong cheedouk, distance 8 miles. Water very scarce, and nearly one mile distant. Our elephants did not come up till 3 p.m.

*January 3rd Tuesday* —At starting slightly descended, and after marching for about 1 mile ascended the Yomah Range, then after several abrupt ascents and descents reached a small stream which we followed for about half a mile to its junction with the Poung Loung or Sittang River. The Poung Loung here is a small mountain stream. It takes its rise from the Tsin-doung Range about 20 miles distant. The road during the last two marches resembles the one we took last year after leaving the valley of the Sittang at Biugatah. During the last two days we have seen no signs of habitations, though a few old Toungyas were noticed in the distance. Encamped on the banks of the Poung Loung, distance of march 6 miles.

*January 4th Wednesday* —Marched to the foot of the Tsin-doung, distance 5 miles and encamped in a beautiful valley enclosed on all sides by high mountains. The Tsin-doung Range forms the boundary between Burma Proper and the Shan States.

*January 5th Thursday* —At starting commenced the ascent of the Tsin-doung, reached the summit after 2½ hours marching in table land more than 5 miles. As the elephants did not arrive till past 10 a.m. we determined to halt here for the day there being no other teakan within a reasonable distance. The plateau where we encamped was 410 feet above sea level. A very cold north-east wind blew here all day. The thermometer at noon stood as low as 60° in the tent, when exposed to the wind it fell to 51°.

The highest peak of the range was found by the boiling point thermometer to be 4,675 feet. In the afternoon visited a village of Toungyas some 2 miles from camp. Outside the village saw a small pierce of Burmese Trap. The Sergeant in command accompanied me to the

village. The houses were very snugly built. The roofs, intended to meet as a protection against the cold winds. Inside they were divided into small rooms about 6 feet by 3 feet. In the centre was left a large room for cooking, &c. In appearance the Toungyos resemble the *Siamese*. Their dress is, however, more like that of the Karen-nees, the women wearing large brass rings extending from the knee to the ankle. They are very wild, though inoffensive, race of people. They keep as much as possible to themselves, and conceal their villages in the most inaccessible positions.

*January 6th, Friday* —To Toung-lah, a large Shan village, distance 7 miles Descended for about 1,000 feet, and then reached the highlands of the Shan States On the road caught sight of Inlay Yua, the residence of the Governor of the Shan States, where we were detained last year for 27 days It was not more than 15 miles distant in a direct line to the south-east Heard to-day that the Governor had reached the village of Yay-nan at the entrance of the Nattick Pass He is on his way down from Mandalay Had he been at his headquarters, I would have deviated from our direct road in order to visit him, though, after the ill treatment we experienced at his hands last year, I have no wish to make his acquaintance

January 7th, Saturday — Marched along gently undulating ground for 10 miles to the village of Oung Ban Cultivation very extensive. The paddy has been all cut in this part of the country some time ago, so it now presents rather a barren appearance No trees are to be seen except in the enclosures of the different villages We are obliged to purchase our firewood at the rate of 4 annas for a cooly load. The Nakan who has accompanied us from Yemaithin told me this afternoon that he had heard that the troops sent from Mandalay to Theinnee had been completely routed by the Shan rebels under Tsanhai He seemed very anxious that we should pass through Inlay-Yua, thence via Nyoung Yooay and Laigyah, to Theinnee He evidently wishes us to delay in order that he may communicate with the Governor.

January 8th, Sunday — At 6 a m the whole hill on which we are encamped was white with frost. My basin of water that I put outside the camp last night was covered with ice about  $\frac{1}{8}$ th inch thick. In the afternoon I walked over the large village of Tsamakan, where we halted last year on our 2nd march from Inlay-Yua. Called at the house of the headman of the village. I was recognised at once by his family, who seemed very glad to see me.

*January 9th, Monday* —To Tingyay-gyat, a large village of Toung-yos and Toungthoos, distance 7 miles Road most excellent the whole distance, and the villages very numerous

January 10th, Tuesday — Road much the same as yesterday. Caught the view of an extensive valley to the eastward, apparently all under cultivation.

Between the valley and the Young Icar one is a low range of hill. Met 100 bullocks from Monai and 100 from Langyah on their way to Tounghoo laden with stick lac kyantaga, sweet meats, ground nuts, Shan boxes, coats, trowsers, &c. Also saw strings of laden bullocks on the plain below on their way to Inlay Yen. After marching N 15 E for 5 miles, reached the large town of Kyonk tat, and encamped in a large cluster of zavats, close to the bazaar and near a fine tank of water.

*January 11th Wednesday* — As our elephants required rest, we halted to day. Since descending the Tann-doung we have seen no jungle whatever. In consequence of the great scarcity of wood the Shans are unable to build good houses, very few are raised from the ground and they mostly have mud walls. Round all the villages are large clumps of bambos and fruit trees owned by the old inhabitants of the place. We are obliged to buy the branches of banyan trees, pumpkins, sugar-cane, &c, as food for our elephants. A quantity of lead ore rich in silver is found in this neighbourhood. I visited the buildings where the ore is smelted. From information obtained on the spot ascertained that from 2 to 3 tickals of silver were paid for one basket (about a bushel) of the ore and that the value of the yield of silver from that quantity was from 3 to 4 tickals. The ore is first smelted in large furnaces and the lead and silver mixed that runs out through a funnel at the bottom of the furnace is placed in another furnace in which there is live charcoal, several inches thick. I did not see the metal placed in this furnace but I was told that about 30 viss had been put in about one hour previously. On looking into this second furnace, a small white speck was visible on the surface of the red hot charcoal. This gradually enlarged, and I saw a flat piece of silver weighing 10 tickals taken out of the furnace with a long iron spoon. This after a little difficulty I purchased for Rs. 15. The information I obtained regarding the working of the mines and the amount of revenue that the Government obtained therefrom was so contradictory, that I am unable to give an opinion on these points.

Having mentioned to our Nakan that I was surprised that the head man of the town had not visited us nor sent any of his subordinates, in the evening one of his writers accompanied by the Nakan, paid us a visit. It was said that the headman was absent the day of our arrival and that being sick he was unable to see us. But these statements I had good reason to disbelieve. The Nakan said he thought it as well if we would halt here four or five days, in order that we might obtain information of what was going on in the Theinnee District. He also stated that he had that day received a message from the Governor of the Shan States expressing a wish that we would proceed by the Young Icar Road. In reply I told the Nakan that we had no intention of halting for four or five days and that we intended to take the shorter and best route to Theinnee as he himself had suggested a few days previously. Moreover that we could pay no attention to any indirect messages from the Governor.

*January 12th, Thursday* — Along a very level road to the village of Taithone Encamped in some paddy-field, near a fine well of water to which the people from more than 1 mile around come to draw their water General direction of march N 20° W till we approached to within about 1 mile to the east of the town of Pwai-lla then turned nearly due north, and saw the town of Quindayah, about 2 miles to the west Country we passed through was very thickly populated To the evening had a heavy shower of rain Thermometer at noon 70°

*January 13th, Friday* — It rained at 6 A M very heavily At 7 A. M, when it cleared up, we started The country as we proceeded became more thickly wooded, and the soil more rocky Only saw signs of two villages during the whole march, a distance of 14 miles. Halted in an old Phoongyee house at a deserted village called Lekpan-kon. The rain came on heavily shortly before our arrival, so we were fortunate in obtaining good shelter for all. Thermometer at noon stood at only 68°.

*January 14th, Saturday* — As the rain was still hanging about, we made a double march of 18 miles to the town of Maing Pyeen Road very good to the whole distance Met about 200 bullocks from Monai and Laigyah The headman stated that they hoped to reach Toungoo, but they had heard that they would be stopped at Ning-yan in consequence of a misunderstanding having arisen between the British and Burmese Governments.

During the last 4 miles gradually descended to the Nyoung-yooay Valley Saw only two small villages en-route Soon after arrival the Burman Myooke of the town sent a writer to enquire whether we wanted anything, and also to conduct us to some good zayats in the enclosure of a large Phoongyee house

*January 15th, Sunday* — Early this morning the Myooke sent us presents of meat, fruit, and vegetables, and shortly afterwards paid us a visit, accompanied by his three wives He stayed about one hour, and seemed much pleased with everything that we showed him As our elephants require a rest, and there is good feeding for them here, we intend to halt till Thursday

*January 16th, Monday* — Engaged nearly all day in looking on at a rather inferior description of Pooay held in front of our zayats. Crowds of people attended, more, I think, to look at us than the Pooay This town was last year completely destroyed by the Nyoung-yooay rebels

The houses have been mostly re-built, and to all outward appearances the town is in a flourishing condition. Fruit and vegetable gardens are very numerous I noticed green peas, broad beans, giam, and a sort of turnip growing in large quantities Shan coats, trowsers, and coarse paper are manufactured here Small game abounds here, consisting of hares, partridges, duck, teal, and pigeons.

From this town we have the choice of two roads one via Theeban and the other via Laugyah. We take the latter though longer, as we shall thereby avoid entering the Theinnee District through the parts that are said to have been lately disturbed.

*January 17th, Tuesday* — Returned the Myooke's visit

*January 19th Thursday* — Marched to Pintau, distance 7 miles at the foot of a small range of hills

General direction N E. At starting crossed to the east side of the plain then passed over a few small hills covered with Einkyin trees, perfectly bare of foliage and encamped on a small mountain stream close to the village of Pintau

*January 20th, Friday* — To Nahtit a large village on the borders of the Laugyah District. Within a few miles of this, the Monai Laugyah, and Maing Pyeen Districts join and there are pickets from each district within a few miles of each other

Road not so good as usual. Crossed one large hill called Nabdit, distance of march 7 miles

*January 21st Saturday* — After proceeding for about 1 mile, saw a large stream running south. This is said to be the Poon Choung that joins the Salween a short distance above the Kaimarpyoo in Karenne. Followed along the right bank of this stream for about 2 miles and then ascended a very steep hill after descending for about 2 miles, reached a tsakan called Maichunoo

We are here surrounded by high hills on all sides. The water is very scarce and obtained from a small spring about quarter mile distant

*January 22nd — Halt*

*January 23rd, Monday* — For the first 2 miles gradually ascended. From the highest point of the range our intended halting place, in the valley below did not appear to be more than 6 miles distant. The road however was very well laid out avoiding all great declivities. The sides of the hills along which the road winds were for the most part steeped & before reaching the valley we found that we had marched nearer 8 than 2 miles.

I camped on the Poon Choung near the village of Kautour

*January 24th Tuesday* — Marched up the Kautour Plain, for a distance of 2 miles in an easterly direction. Then crossed a low range of hills and descend to the Laugyah Valley. The fog was so thick till past 9 a. m. that we could see nothing of the surrounding country. From the number of villages passed it appeared to be densely populated. The town of Laugyah is situated towards the middle of an enormous plain that runs nearly north and south. Formerly it was one of the most important towns in the Shan States but now it might easily be passed without notice were it not for the large parapet and ditch that surround it.

No houses are seen from the outside, the town being completely shut in, like most of the Shan villages, with thick clusters of bamboos. Distance of march 12 miles

*January 25th, Wednesday* — As our cattle require rest, we will halt for four days. We have found excellent quarters in some zayats, near the bazaar, to the south of the town. There is excellent shooting in the neighbourhood, so a few days' rest will be agreeable to all.

*January 26th, Thursday* — Visited the Tsaubwa, a young and very intelligent-looking man. He lives in a large, though very rickety, bamboo house in the centre of the town. The enclosure is protected by a brick wall. Inside are several large sheds for the troops. The Tsaubwa has only held his appointment since January 1864. During his father's time, the town was very large, but subsequently, on his elder brother succeeding to the Tsaubwaship, frequent disputes arose between the Laigyah Shans and those of other districts; and, as the present Tsaubwa said, "this town since my father's death has been attacked and destroyed every three or four years."

I asked the Tsaubwa several questions about roads, &c, to very few of which he would give only direct answer. At last he referred us to his ministers (as he called them). On asking one of them to send for merchants who were in the habit of travelling between Laigzah and Theinnee, in order that we might obtain information regarding the different roads, he made the astonishing statement that, during the nine years he had resided at Laigyah, not a single party of traders had ever come down from Theinnee (We met a large party near Yemaithin, who had come down from Theinnee via Laigyah). A report that we heard on the road between this and Maing Pyeen of an outbreak in the Monai District, has been confirmed. The large town of Moukmai, one march south of Monai, has been attacked by a numerous body of Shans and Karenies, headed by one Kyan Pinayah, and the rebels are now threatening Monai.

Yesterday the Tsaubwa received an order from the Governor to proceed himself with 1,000 men to the disturbed district. The Governor has started from Inlay with 3,000 troops.

*January 27th, Friday* — Received a message from the Tsaubwa, saying that as the Nakan would not give him leave, he was very sorry that he could not return our visit. He also said that he did not dare to show us any civility in the way of sending presents of food, &c, lest the Nakan should place a wrong construction on his acts. Last year we found that the Shan officials showed us every civility, and the Burmese none at all. This year matters are reversed.

*January 28th, Saturday* — Since our stay I have been all over the surrounding country

To the south are the remains of most extensive fortifications, enclosing an area of about four square miles. This is the remains of the old city

that has been deserted for upwards of a century. The present town formerly extended far beyond its present limits. The former inhabitants are now scattered in small villages in the neighbourhood where they find themselves much safer from attacks than when living close to their Chief.

There are three large lakes within a mile of the town, containing large numbers of duck and teal. Hare and partridges are very plentiful though the former are killed in large quantities.

*January 20th, Sunday* —The Traubwa sent over to say that news had just been received that the rebellion in the Monai Di tract had spread northward, and that a large body of rebels had arrived at the Maing Naung Frontier (our intended route lay through the principal town of this district) in consequence of this, he wished me to proceed by the Maing Kaing Road more especially as an ill feeling had long existed between his people and those of Maing Naung and large bodies of men were still stationed at their respective frontier posts. The Traubwa also wished us to remain four or five days longer, in order that more reliable information might be obtained of the movements of the rebels.

We agreed to change our route, but not to prolong our stay.

*January 30th, Monday* —To Maing Kan Village distance 8 miles. The road followed along the western side of the plain. At 2 miles passed the large Bazaar of Bomin Pon, in the vicinity of which there are said to be several villages.

*January 31st, Tuesday* —Crossed the western range of hill 1, a rather difficult road for elephants. At 6 miles reached the highest point where a boundary pillar marks the division between the Langyah and Maing Kaing Districts. Two miles farther on reached a small village called Hin Yua where there is a small outpost from the chief town. Encamped in some paddy fields below the village.

Direction of march N N W

*February 1st, Wednesday* —By a good road to the town of Maing Kaing, distance 10 miles, crossed several small valleys extensively cultivated separated from the large Maing Kaing one by small hills. Marched up the chief valley for 3 miles, and encamped about 1 mile to the north of the town in a large zarat.

The Myrooke was encamped a short distance outside the town with a body of 300 men. He is under orders to march to the disturbed part of the Monai District. The town contains about 100 houses. A large manufacture of pottery consisting of goglets, pans, jars and cups some of excellent design is carried on here. I could not find any work in very plentiful. On the hills bounding the valley live a wild tribe called Falangna. They cultivate the poppy extensively in their sangyas. The manufa-

ctured from these sell in the town for Rs. 10 a kie.

*February 2nd, Thursday* —In a northwesterly direction up the valley for 3 miles past several large villages crossed a low, small hill, and en-

camped in a small valley on the Them Choung near the village of Bant-suk, distance 7 miles.

*February 3rd, Friday* —One of our party being very unwell, we were obliged to halt for the day

*February 4th, Saturday* —Marched 9 miles to the village of Mah-mom. Encamped amidst a fine clump of bamboos near a tank. For the first 3 miles the road followed along the left bank of the Them Choung, and for the remainder of the distance wound round several small hills, on the slopes of which were several toungyas ready prepared for burning.

*February 5th, Sunday*.—Halt

*February 6th, Monday* —To Kyai Houn, distance 10 miles. Road very level the whole distance. At 8 miles reached the boundary between the Maing Kaing and Bansan Districts. Villages very numerous towards the end of the march. A hot spring occurs close to the road near the boundary of the districts in which the thermometer rose to upwards of 100°

*February 7th, Tuesday* —The road passed in an easterly direction through one of the most beautiful valleys we have yet seen. The villages passed were very numerous. Encamped near a large stream on the south side of the town of Bin San, distance 6 miles. There are numerous hot springs near this spot, in one of which many of our men bathed. The town itself consists of not more than 30 houses, but the bazaar outside is very large, and the adjacent villages numerous. A Tsaubwa resides here, but as he was engaged at a Pagoda some distance off, we did not see him. From his people we obtained good information regarding roads. We have the choice of several. The one our Nakan wishes us to take lies in a N N W direction to the town of Lah-sho, the residence of the Tseetkai, of the Theunnee District, distance said to be 100 miles. In consequence of the late disturbances in that district, caused by one Tsanhai who drove the Tsaubwa out of Theunnee, and now remains in possession of the town, it is impossible for us to take the route laid down in the Royal Pass. Now as it is time for us to shape our course in an easterly direction towards the Salween, I do not consider it advisable to make any further westing, especially when it is considered that the Tseekai would not allow us to enter the parts of the district when Tsanhai still retains his influence, and would probably direct us to the river in a S E direction. As I can hear of no good roads in a N E direction from here, I am induced to proceed to the town of Maing Shoo, which is said to be 50 miles to the east of this, and only two marches from the Salween.

*February 8th, Wednesday* —In a direction E 15° N to the village of Heintone, distance 8 miles. The road was well beaten, and apparently there was much traffic thereon. Encamped on a small stream near a large bazaar. Noticed for the first time a race of people called Yinnees. They are in appearance like Toungthoos. The peculiarity in the women's dress consists of broad bands of wine fastened round their waists. As

there are fastened very tightly  
their dresses, I fancy that a change of  
clothes is a rare occurrence with  
them. The race of Yins are said to be  
very numerous. There are three tribes of them speaking different  
languages, viz., Yinnies Yinnies and Yinhans.

February 9th Thursday — Proceeded in the direction E. 20 N to  
within one mile of the village of Kyeing Lin, where a grand possey  
on the occasion of offering gifts to the Phoongyees was being held.  
About 10,000 people were encamped on a plain outside the residence  
of the chief Phoongyee of the district. Shortly after our arrival, the  
Kyeing Lin Traubwa accompanied by his wives paid us a visit, bringing  
presents of provisions &c. He appeared to enjoy his visit very much, and  
before leaving begged of us to halt the next day for he expected the Ban  
wut Myooke and several other officials to arrive in the course of the  
evening. Now as the Banwut Myooke is the head of this district, it  
will be as well to meet him. He is a Burman and a protege of the  
Magway Mengyee (one of the ministers of the Mandalay Court).

February 10th, Friday — Early in the morning received a visit from  
the Myooke. He was very affable in his manner. He strongly  
urged us not to proceed any further towards Maing Shoo, pointing out  
that the rebellion in the Theinnee District had been quelled and that  
if we went to the Tockkai, he would send us on to Theinnee, from where  
we could reach the Salween by a good road. He called some of his  
officials and led them about the Maing Shoo road. They all  
pronounced it impracticable for elephants and bullocks. The Myooke  
then stated that Lashio the residence of the Tockkai, was only 12 miles  
distant to the N. F. He wound up by saying ' If any thing  
that I have told you of is not perfectly true report me to the Magway  
Mengyee for he is a minister who detects deceit' (As it afterwards turned  
out nearly every thing that he told us was false). The Myooke's state-  
ment regarding the roads and the state of the Theinnee District differed  
greatly from what we have previously heard and I am at a loss how to  
act. From former experience I am convinced that if we take a route that  
is not approved of by the Burmese officials we can expect no assistance  
at the river bank. The Nakan's written instructions to the effect that we  
should go to the Theinnee Tockkai evidently have a great weight with  
all. Our Nakan left us on the 9th and proceeded to the Myooke's  
town where after half an hour's consulting with the Myooke he was re-  
mained. All things considered, I determined to proceed to Lashio.  
There is a caravan of Chinese traders here from Taile, the chief town of  
the Shan Tavoke. They brought down about 20 mules laden principally  
with straw hats, carpets, copper vessels, wax, honey and walnuts.  
These straw hats were selling at the Jomyi ground from Rs. 1 to 5 each.  
The headman told me that he had already sold 100. After I had  
visited the Myooke and Tawwas who were encamped on opposite the  
thousands who had come in from the surrounding districts, I made  
off northward, which the full in a Tat boat. At first

walked through the bazaar, and visited the Chinamen's stalls, also the presents for the Phoongyees which were very tastefully arranged on stands of filigree work, and on miniature pagodas in the Kyoung enclosure

*February 11th, Saturday.*—Marched in company with the Myooke to Banwut, where he resides. He tried hard to induce us to halt here, but having marched only 5 miles, we were obliged to move on. Crossed a large stream, the ford was rather deep, and some of our bullocks' baskets were wetted. Found our Nakan taking it easy in the Myooke's house. He had evidently made up his mind that we would be persuaded to take this road. Halted at Maing Tha, where there are some good zayats in the enclosure of a Phoongyee house, distance 10 miles, direction W. 40° N. Went out shooting near the village. One of the villagers came out to witness the sport, I showed him my gun, and he appeared much astonished at the way I shot several imperial pigeons. The man carried a long bamboo, and seemed to be slightly intoxicated. As I was turning off the road to go back to camp, he made a blow at me with the bamboo. I instinctively lowered my gun from my shoulder with no other intention than to guard the blow. The man immediately ran off to the village, calling out that I had attempted to shoot him. The people of the village, to the number of 30 or 40, turned out with guns, spears, and sticks, and approached the zayat, where we were staying in skirmishing order. I kept most of the men inside the zayat, and remained myself outside. The headman of the village and the Nakan shortly afterwards came up, and after some difficulty, succeeded in appeasing the rabble. Some of the villagers were one time on the point of coming to blows. After they had dispersed, the headman came and begged of me not to take any further notice of the outrage, which they excused on the plea that they had had a grand feast in their village, and all the people were drunk. I mention this to show what a lawless race the Shans of these parts are, and how exceedingly careful it is necessary to be, in order to avoid giving them offence.

*February 13th, Monday*—At 4 miles passed the large village of Banmau. Marched on for 8 miles further, and encamped in the jungle near a small stream.

*February 14th, Tuesday*—To Ootee, distance 11 miles. At 8 miles reached the high road leading to Theebau, which is said to be distant five marches. From this point our Nakan turned off from the high road we had been following, and passed to the west of the village of Banzin. This proved to be anything but a short cut, (as the Nakan called it,) for we twice lost our way.

*February 15th, Wednesday*—Descended to a large plain and passed several large villages. Halted 3 miles beyond Maing Tseit, near the Noh-wee Kyoung, in the enclosure of which we encamped. Since leaving Banwut, we have been marching considerably to the west of north, though the Myooke assured us that the Tseetkai's town lay to the eastward.

*February 16th Thursday* — The road to-day was very difficult for our cattle. At 8 miles crossed a deep stream by a very rickety bridge over which we had the greatest difficulty in driving the bullocks. The elephants took a long time in picking their way amongst the large slippery rocks on the bed of the stream. As we were in want of rice we were obliged to continue our march to the village of Hotee, distant 13 miles.

*February 17th, Friday* — At 8 miles crossed a large stream that runs into the Myik ngai one mile further passed the large village of Banar after which we gradually ascended for nearly 5 miles, till we reached the village of Toun, late on the top of the range that bounds the south of the Lahsho Valley. Here there were signs of the fighting that has lately been going on in this part of the district. In the village itself was a small earthwork, and at the narrow passes of the hills we ascended to-day were similar defences. Several villages that we have passed during the last two days were completely deserted. Distance of march 9 miles.

*February 18th Saturday* — To the residence of the Theinnoe Treetkai distance 10 miles. I encamped about 1 mile to the south of the stockade. All round about are the skeletons of the Shans and Burmese who fell in the recent fighting that took place here about three months ago. The Thennoe Traubwah being driven out of the town by the rebel Tuanhai or Shunhai as he is called by some, came and took refuge here with the Treetkai. Tuanhai sent a large force of Shans and Kachinns to attack them. The Burmese troops said to number 500 men together with the Traubwa's men were starved out by the rebels and were forced to beat a hurried retreat leaving all their sick and wounded behind. Upwards of 500 men are said to have perished in the valley. The town of Theinnoe and all the adjacent villages have been burnt to the ground. Tuanhai has sent presents to Mandalay, together with a letter stating that he has not been fighting against the Government, but merely with the object of turning out Young Pho, who is universally detested. Matters are at present quiescent, pending the negotiations going on between Tuanhai and the Government through the

*February 19th Sunday* — Visited the Treetkai who is an old man at 70 years of age. He was for 10 years Treetkai of Menai and before the appointment of G. V. Root of the Shan States was made (16 months ago) he was the head chief in the country. He treated us with great courtesy and advised us to proceed to the Salween by a road to the a town as it was inexpedient that we should pass through that part of the district where Tuanhai gained his influence.

There are 1,000 Burmese troops stationed here at present who guard the small state in which he rules the Treetkai and the remainder with other two officers are in a largest part to the right and at out and instant.

*February 19th 20th and 21st Monday and Tuesday* — Handed in to the Treetkai again the day before leaving. He is a

tioned that during the time he resided at Monai, he made frequent inquiries regarding the Salween River, with a view of ascertaining whether it was navigable between that town and Theinnee, but he received such accounts of the dangerous nature of the rapids, that he gave up the idea of sending persons to descend the river on rafts from Theinnee. Had the river been practicable for either rafts or boats, he very truly said that the fact would have been known long ago, and that the Chinese traders would, if they could, bring down their merchandise from the frontier to the Monai District. The Tseetkai promised to send a Myooke to accompany us, furnished with the requisite orders in Shans and Burmese, so that we might experience no difficulty in obtaining whatever assistance we might require from the heads of villages, &c.

*February 22nd, Wednesday*—Marched to the village of Maingtin, distance 7 miles. Here there is an outpost of Burmese troops from Lahsho, numbering 100 men. This village was burnt down by Tsauhai's people some three months ago, and the unfortunate inhabitants are living in small huts of straw in the paddy-fields.

*February 23rd, Thursday*—Road as yesterday, very good. Passed several deserted villages, the inhabitants of which are said to be hiding in the jungles pending the settlement of Tsanhai's business, for they do not feel at all sure that hostilities would not be renewed, and they are too weak to defend themselves. Halted at the large village of Maingyin, distance 9 miles. This valley is thickly populated, and during the late rebellion, the people erected stockades, and made such a show of resistance that they were unmolested by the rebels.

*February 24th, Friday*—Maingyau, distance 11 miles. This is now the largest town in the district. It is situated at the foot of a range of hills running nearly north and south, one of the prettiest valleys we have yet seen. The villages in the neighbourhood are very large and numerous. The Tamong, head Shan of the village, who paid us a visit shortly after our arrival, mentioned that in case of a disturbance he could collect 1,000 men in a few hours.

*February 25th, Saturday*.—As this is bazaar day, and we shall see no other town for a long time, we halt for the purpose of buying in supplies.

*February 26th, Sunday*.—This afternoon a letter addressed to me arrived from Tsanhai, the rebel Chief at Theinnee. It stated that as it was directed in the Royal Order that we should proceed to the Salween River to the east of Theinnee, it was not proper that we should continue our present route. There were wild tribes near the Salween with whom he, Tsanhai, had influence, who would certainly attack us if we went on. In other words, Tsanhai says with the wild tribes near the Salween I have influence, and that influence I will not use to prevent your being attacked. The Tamong must also have received some communication from Tsanhai at the same time, for though he had before promised us every assistance, he now refused to obey the Tseetkai's order, not only to

accompany us himself, but also to send a party with us to the next village. Our Nakan and the Myooke agreed that Tranhai was annoyed at the Theetkai ignoring him altogether, and dissuading us from going on to Theinnee and that he would certainly issue such instructions to the Ka khyens living near the river as would prevent our obtaining any assistance from them if he had not gone as far as to order them to stop us by force. An express was sent off to the Theetkai at Lahsho, and he also gave his opinion that it was inexpedient for us to go on. We therefore returned to Lahsho. Immediately on arrival visited the Theetkai, who seemed very sorry at what had occurred. He mentioned that under present circumstances his authority could not be said to extend beyond the stockade. None of the heads of villages would come in to him, all were waiting to see how Tranhai's negotiations with the Burmese Government terminated. As the Theetkai and Tranhai are known to be enemies, they are unwilling to compromise themselves by declaring openly for either party. The Theetkai advised us to try some of the roads to the southward. He promised us orders to all the heads of villages, though he did not know that they would be obeyed. As some of our elephants are knocked up, and our bullock men whom we engaged only to Theinnee refuse to accompany us any farther, we determined to send all our heavy baggage to Mandalay, and to proceed ourselves to the river with about 20 cooly loads on elephants. The Theetkai said that he would try and engage coolies for us, but after waiting for three days we were informed that in consequence of all the surrounding villages having been destroyed the people were not willing to leave their families whilst matters continued in the present unsettled state. What with trying to engage coolies and arranging to send our heavy baggage to Mandalay, we were detained at Lahsho till the 6th March. We find it necessary to march back four days journey to Bantio. From there we will make our third attempt to strike the Dolteen. Left Lahsho on the 6th, and arrived at Ban zu on the 10th March. The Tamong of the village visited us shortly after arrival, and procured us a few coolies. The head men of all the villages we have passed through since leaving Lahsho have promised to provide us with coolies but invariably as we were about to start sent to say that they were not procurable.

*March 11th, Saturday* —To Maingyai distance 8 miles. This is a large village with a fine bazaar. I camped outside a Pboongyee house near a large tank of water on the south side of the town. The Tamong was absent at a Pagoda about 1½ miles distant. In the evening one of his relations came over to tell us that they expected to be attacked that very evening by the men from the neighbouring district, and that we should not be alarmed if we heard firing. The people of the district expected to attack could only muster 500 muskets, whereas Maing yai could muster 1,000 so there would be no doubt as to the result. Shortly after leaving no several muskets were fired. This was taken up by the surrounding villages, and during the night armed bodies of men came pouring into the Tamong's village. The cause of all this excitement was that some

buffaloes had been stolen and traced to the Maing Yau district, and on restoration being demanded, a dispute arose as to whether the tracks found were those of the stolen buffaloes or not. In some parts of the Shan States these kind of disputes are of frequent occurrence, and they generally end in one village attacking another.

*March 12th, Sunday.*—Early this morning the head Shan came and informed us that there was no chance of their fighting for some days to come, as the matter was then under negotiation. Large bodies of armed men, however, remained in the village during the day, and several small earth-works were thrown up near the different approaches.

*March 13th, Monday.*—To Man Pai, distance 15 miles. There was no good halting place on the road, so we were obliged to make a long march. Halted on the bank of a large stream close to the village.

*March 14th, Tuesday*—Marched 8 miles to some paddy-fields, 2 miles beyond the large village of Ban Pon. Road very good, and villages passed numerous.

*March 15th, Wednesday.*—Crossed small range of hills in an easterly direction, road difficult for elephants. In a distance of 6 miles did not once come across water. Halted on the bank of a large stream, 2 miles beyond Looai Shing, distance 9 miles.

*March 16th, Thursday*—At 6 miles passed the large village of Kah-douk, where there is a fine bazaar, 3 miles farther on crossed the Bin Choung. The water was nearly 4 feet deep at the ford. Halted at Maing Kah, 3 miles farther on. In the afternoon sent over to the Tamong for guides to conduct us the next day to Maing Loon, the residence of the Tsaubwah of the District. The Tamong said that to-morrow being bazaar day, the Tsaubwa himself would come to Maing Kah, and that without the Tsaubwa's orders, he could not provide us with guides.

Shortly afterwards the Tamong's brother visited us, and on protesting against the delay, and producing the Tseetkar's orders in Shan, he made the astonishing statement that nobody in the village could read the Shan language. (The Tamong himself read it fluently enough the following day.)

*March 17th, Friday.*—There being no help for it, we were obliged to halt to-day. About 1 P.M. the Tamong, accompanied by a Shan sent by the Tsaubwah, visited us. It was said that the Tsaubwa himself was too unwell to come to Maing Kah, but that he had instructed the Tamong to communicate his orders, which were that we could not be allowed to go down to the Salween through the town of Maing Loon; the only reason given was that the road was not a good one. We explained that we had no intention of taking our elephants to the river bank, but that we wished to go with our coolies by the road through Maing Loon, by which traders were in the constant habit of going. We showed him our Royal Pass and the Tseetkar's order. On reading the latter, he appeared much amused, and on our mentioning that the

Tecetkai had directed us to the town of Maing Loon, he said "I do not understand why you wish to take the road through the Traubwa's town when there is a much better one to the southward. The Traubwa's orders are that you take the south road and it is of no use talking any more about it." Finding that further argument was useless we asked for a guide to take us by the road named by the Traubwa. The Tamong said "you can have one, if you pay me 8 tickals of silver." Though it was a regular imposition, I was obliged to produce my Rupees. The Tamong at the same time produced a pair of scales and weights, and ended by making me hand him over Rs. 8 $\frac{1}{2}$ . From subsequent inquiries made ascertained that the Traubwa arrived about noon and stopped in the jungle near the bazaar; also that the reason why he did not wish us to visit him was that he is building a strong fortification round his town, which he does not wish our Nakan to see. No Burman official has ever yet entered Maing Loon the Traubwa of which pays no regular tribute to the Burmese Government. I was told that, had we been by ourselves every civility would have been shown to us. Here we are within three easy marches of the Salween, and balked for the third time.

*March 18th Saturday* — Marched nearly due south for 11 miles to the village of Ho-nam, and encamped on a stream that runs from under a hill close to the village. This was the only drinkable water met with since starting this morning. Road very hilly. Saw nothing but *Toungfa* cultivation.

*March 19th Sunday* — Road level and good till we reached the village of Ban Loon; crossed a high hill beyond, and encamped in a small open space of ground in the midst of the hills. Distance 10 miles.

*March 20th Monday* — To the village of Hotee distance 6 miles. We had intended to march on 4 or 5 miles farther but the Tamong of the village said that we must sleep here one night for the Maing Loon Traubwa had sent him an order that he was to send on men with us to the river bank first ascertaining whether the road was open if not to have it cleared (This is a mere excuse to detain us in order that the villagers may have an opportunity of seeing us.)

*March 21st Tuesday* — Started off with the Tamong a neighbor at our guide ascended about 600 feet in a distance of 3 miles to the village of hanpon. From here there was a very long and steep descent to the Salween River which we reached at a point about 6 miles from this village. Close to where we first saw the river the stream ran with great velocity between two large masses of rock and was narrowed (as we afterwards measured) to 96 feet. We encamped about half mile beyond this upon a bank at the Two-hole Ferry. On both sides of the river here there is a lack water the breadth of which is 100 yards. Bullocks swim across here with ease. During our stay we saw three batches crossed. The load of course carried in boats. A ferry rate is here charged of one tickal of silver for 6 black bullocks and one anna for each person. The ferry boat cost

the Mau Pwah District, the Tsaubwa of which lives on the east bank of the river at the town of Banpan, said to be about 16 miles distant. This Tsaubwa has a narrow strip of territory on the west bank of the river, about 10 miles in length.

*March 22nd, Wednesday.*—The head Shan of a village near which we passed yesterday brought us a present of some rice and four coothes that I had asked for. Shortly afterwards a man from the Tsaubwa's village made his appearance. He made many inquiries regarding the object of our journey. I gave him some presents, and he went away promising in the evening to send us over four coolies. In the evening received a message to the effect that we must not cross the river until orders had been obtained from the Tsaubwa. During the day I crossed the river and went to the Oo-Noung Bazar, about 2 miles up the river. Here I saw a great variety of European manufactured goods exposed for sale, including silk and cotton kerchiefs, muslins, long cloth, needles, thread, and cutlery, and selling at about four times the Rangoon prices. In a small village close by were stored large quantities of cotton. This is mostly bought by the Shan-tayoks who live on the borders of China. Two days ago we met 100 bullocks laden with cotton on their way to Talle, the chief town of the Shan-tayoks. The cotton is grown by the Kakhyens and Lawas, who live on the neighbouring hills. I saw several Lawas in the bazaar, they are a very wild looking race of people. They wear short uncombed hair. Their sole dress consists of a small waist cloth.

The Kakhyens, who are more numerous farther north, are equally wild in appearance and scanty in dress. I also saw in the bazaar a race of people called Motsoos. They are in appearance like the better class of Kaiens living in the plains of British Burma. Their dress is very becoming. It consists of a black cloth jacket, embroidered at the cuffs and collars, black Shan trousers, and a gaily coloured turban. I brought four of them to our camp and made them small presents. They say that they are an independent race under a Chief of their own, and that they resided to the N E about a fortnight's journey from here. They could only talk a few words of Shan, so there was difficulty in communicating with them.

*March 23rd, Thursday*—Early this morning, the ferrymen, after crossing over several bullock loads, took their raft to pieces. It consisted of a platform of bamboos placed across two boats fastened together. I imagine that this was done as a hint for us not to cross. Having waited till one hour past noon, and receiving no message from the Tsaubwa, as was yesterday promised, we secured one of the boats and commenced crossing over our baggage. The ferrymen said that they did not object to our using their boats, but that they would rather not assist us themselves. I must here mention that finding it impossible to go down the river on rafts, or for our elephants to follow along the river bank, we determined on the day of our arrival to send back our elephants one march

to Hotee, thence by Maing Shoo and Maing Noun to Laigyah, and to proceed ourselves for a week or ten days along the river bank visiting the various rapids that are said to exist. An insurmountable barrier of rocks is said to stretch across the river at no great distance below this, so there would be no particular object gained in taking a section of the river at this point even if it were possible, which I doubt for, from the experiment already made, it appears that the lead cannot be got to the bottom in consequence of the great velocity of the current.

We are, moreover, running short of rice, and not having a day to spare, we are compelled to push on. In the evening the headman of a village in the Nau Pwa District came to our camp. As soon as he ascertained that our Nakan would accompany us no further, he gave orders to the ferrymen to re-construct their raft and cross over the remainder of our baggage.

*March 24th, Friday* — After marching along the river bank for about 3 miles reached a rapid where the water ran with great velocity for a distance of about 100 feet. The fall was, I should think, about 3 feet. Below five distinct waves were formed. One mile further on came to what is without doubt, an insurmountable obstacle to the navigation of the river.

An enormous mass of rock about 50 feet high stretches across the river, the water finds its way through five small passages. The opening on the west side is the widest, about 20 feet, but on the side of this small channel appears the top of a sunken rock, so I doubt if there is sufficient depth of water for a breadth of more than 18 feet for the passage of a boat, but as the water rushes through this passage obliquely, being reflected by a large rock in the middle of the river I doubt if any description of boat could pass through. For the next 3 or 4 miles we went up and down very steep hills though the distance of the march was not more than 7 miles, we did not arrive at the village of Maupwa till late, for we went down to look at the river from three or four points the descents being very steep and difficult. At Maupwa resides a nephew of the Taulwa's. He sent a Shan out to meet us, but he could not make up his mind to visit us the day of our arrival, but wanted us to halt the following day.

*March 25th, Saturday* — Marched along a most difficult road for 5 miles till we reached the Maingshoo Ferry. Only twice caught sight of the river in the distance. In the evening moved on 3 miles farther to the large village of Banpan, when resides the Maupwa Taulwa.

*March 26th Sunday* — Requiring fresh coolies and guides we sent a message early in the morning to the Taulwa. He sent back word that he would visit us in the evening. He however did not do so but sent his son with a request that we would halt the next day in order to give the Taulwa an opportunity of passing us a long visit.

*March 27th Monday* — We were again obliged to halt much as we did the previous day. At 9 A.M. the Taulwa came down to our camp and

pained by five of his wives. Having shown him everything that we had, he expressed a desire to see us eat our breakfast. It being then past 11, we were perfectly willing to gratify him. After breakfast he retired to a zayat close by, as he said, in order that he might have a long look at us. He made us several presents, for which we made a suitable return. He mentioned that when he first heard of our arrival, he felt very uneasy in his mind, not knowing the object of our coming, but since we had explained everything to him, he was very glad indeed to see us, and hoped that we would remain three or four days.

From inquiries made, finding that it is impracticable to start from here by rafts, we intend to march along the river bank for some distance, and, if possible, go down by rafts to the Takkau ferry, on the borders of the Monai district.

*March 28th, Tuesday.*—After marching along the river bank for one mile, came to a very awkward obstruction. A mass of rock 50 or 60 feet high stretches half way across the river (width of river above and below about 250 feet). The whole force of the stream dashes against it, and a strong back-water is formed on the opposite (left) bank. At the upper extremity of the back-water a large shoal is formed, so a boat going down stream would be obliged to keep well on the right bank, and when within 20 or 30 yards of the rock steer towards the left bank. The chances are, however, that the immense force of the stream would draw it on to the rock. A small boat or raft might be dragged by ropes through the back-water. Three miles farther on came to a spot where three rocks run out about one-third of the way across the river from the left bank. Looking up-stream, five small rocks about 10 feet above water appear. There is a sufficiently wide passage between them of 70 or 80 feet. A short distance above and below these masses of rock, the river turns off at right angles. The current is not strong at present, but during the rains it would be a very difficult place to navigate, in consequence of the many short turnings round the rocks. After marching nearly all day, and only making 8 or 9 miles, halted opposite to the village of Bantsoot. The road was very bad, and our coolies had the greatest difficulty in getting along. In some places a false step would have precipitated one down a clear drop of 50 or 60 feet to the rocks below. In the evening the head man of the village came across to see us. He mentioned that if we continued at the rate we had been going to-day, we would not reach the Takkau ferry under 10 days, whereas on rafts we could get down in  $2\frac{1}{2}$  days. He offered to go and consult with the people of his village, and let us know in an hour's time, whether any were willing to venture down on rafts at this time of the year. About 8 P.M. he returned, and after a little bargaining, we came to terms. It will be necessary for us to halt two days.

*March 29th and 30th, Wednesday and Thursday*—Engaged during the whole of these days in constructing two rafts. The larger consisted of 42 large bamboos, and was 60 feet long by 18 feet broad. The smaller

50 feet by 10 feet. On each was a platform raised 3 feet in the centre of the raft.

*March 31st Friday*—At starting some of our Shan coolies hesitated to get on the rafts. They had never before been down the river, and a very ugly looking rapid throwing up clouds of spray was visible in the distance. After a little persuasion we got all on board, and in a few minutes were shooting the first rapid. We went at railway speed for a few seconds down a regular slope, then the raft entirely disappeared under the water, the raft men being covered up to their waists. The water splashed up through the flooring of the platform and wetted some of our baggage. The second rapid, a few hundred yards below, was the worst. We appeared to go down a drop of about three feet, and then over a large wave into the trough of which we had no sooner descended than a second wave broke over my side of the raft, dashing the water into my face. I was then sitting three feet above the raft. We shot four other rapids that to look at from the shore, I should have thought that a raft could have gone down in safety. The most dangerous place of all however was at a broken line of high rocks across the river, through which there were 3 passes. We took the centre and narrowest one, because the enormous strength of the current through the wide channels would have drawn us on to some rocks below. Through the centre opening we shot like lightning grazing the rock on one side and not having more than 10 or 12 feet to spare on the other. A short distance below this we passed a large stream called Namkah-Choung that runs past the town of Kyengton on the east side of the river. For the next 8 or 10 miles the water ran swiftly and smoothly with the exception of one rapid about half mile in length, close below the Namkah Choung on which however the waves rose to no great height. During the day we must have gone down nearly 40 miles. Halted for the night on a small sand bank near the village of Tonbon.

*April 1st Saturday*—Down the river for 20 or 30 miles to the Takkan ferry might have gone the whole distance with perfect safety in a canoe. Villages very numerous on both bank. The Takkan ferry is situated in the Samoet di trict. The head official (a Burman) resides at a village on the river bank at the end of the di trict. This district is again under the Welet Wun, a son of the Governor, or rather the ferry collects a which amount to a large sum every year are paid in to him. The districts about here are most easily divided. On the west bank where our raft men came from was the Maing Young district, and on the opposite bank the Maing Na di trict. Twenty miles lower on the west bank comes the Samoet and on the east bank the Kengton district. At 10 or 11 miles Takkan comes again the Maing Young, and a few miles lower the Morai di trict.

rapid, where it narrowed to about 250 feet. Five hundred yards above the rapid the stream runs like a sluice, and when within 100 yards goes down an incline, at the bottom of which it appears to strike against a sunken wall of rock, for the river rises up in one enormous wave, about six feet high, and curves backwards in a sheet of foam. I sent a portion of a raft that I found near down this rapid; it disappeared altogether for 10 seconds and came up some 50 yards below, end uppermost. It however righted and floated down the stream. From inquiries made ascertained that there are five rapids between this and the Kainee Frontier impassable for rafts at this time of the year. The disturbances in the Monai district and the lateness of the season will not however allow us to visit these. The Monai district is at present over-run with dacoits, and there is no likelihood of the rebellion being quelled for some time to come. Had we not seen so many insurmountable obstructions in the river, I would have pushed on at all risks through the Monai district, but as the question of the navigability or otherwise of the river above the Monai district is pretty well settled, I think that the state of the river lower down, may, from all the information I have collected since reaching the river bank, be assumed to be as bad as what we have ourselves witnessed in the 80 or 190 miles we have descended the river. I may here mention that at present the river is at its very lowest; in a few days it is expected to rise, in fact it did so slightly last night. During the height of the rains it is possible to go down from here on rafts to Dahquintiske, about 50 miles above the Hatgyee, between Theinnee and Takkau it is impossible to do so at any season of the year. The rise of the river during the rains is in some places as much as 80 feet.

*April 3rd, Monday*—At starting had a very tedious ascent to a height of above 2,000 feet. Descended very slightly, and after passing two small villages, halted at a Khyoung, near the large village of Pinnie in the Monai district and within 100 yards of the Maing Noung district, the two being separated by a large stream. Only during the last 5 miles of our march did we cut across a corner of the Monai district. We will not enter it again. Length of march 10 miles, direction west.

*April 4th, Tuesday*.—To Konheim on the Bin Choung, the stream that we crossed on the 16th ultimo. It is here nearly 300 yards broad, the stream running very slowly, and being very shallow in places. About quarter mile farther up, the channel is greatly contracted, and there is a fine water-fall with a clear drop of five or six feet. Below there are said to be a great number of rapids. The road along to-day's march (12 miles) was good.

Three small hills were crossed. At 4 miles passed the large village of Kahlooai, where resides a Tamong. The Konheim Tamong paid us a long visit in the evening, and was very civil in providing us with guides and coolies without any delay.

*April 5th, Wednesday*—Passed numerous villages on the road, the largest of which was Laikan, road good the whole distance. Halted at

the small village of Thaumon distance 13 miles. Water about half mile distant

*April 6th Thursday* — Along an excellent road to the town of Bassein, the second largest town of the Maing Nyoung di tract, there is the largest bazaar here that we have yet seen. It is said that since the destruction of Laugyah this place has greatly increased in importance. Three large roads meet here from Maing Kaing Maing Nyoung and Laugrah. Cultivation all about most extensive and villages numerous. Encamped in the bazaar near a fine stream of water; distance of march 12 miles.

*April 7th Friday* — Road and appearance of country much the same as yesterday. After marching 4 miles entered the Laugyah district. Halted at the village of Pashee near a large well from which the people for a long distance around draw their water. Length of march 14 miles.

*April 8th Saturday* — To Laugyah distance 16 miles. Here we met our elephants that we had sent on from the Salween via Maingshoo and Maing Nyoung. The road from Maingshoo to Laugyah is described as an excellent one for carts. The same may be said of the one we have come along during the last two days. At 2 miles from Laugyah crossed the Maing khaing stream that runs into the Ben Choung.

*April 9th Sunday* — Halt

*April 10th Monday* — Left Laugyah this day and returned by near the same road that we came as far as Taithone which we reached on the 16th instant. From here we marched to the town of Pocayhla, and thence down to Burma Proper striking the valley of the Irrawaddy at the large town of Ilhne Dek on the 21st April. From Ilhne Dek made the town of Yemaithin a distance of 30 miles in two marches. Halted for rest at Yemaithin for two days. This is the first halt we have made since leaving a distance of 100 miles. The Ilhne Dek road is said to be the best from the Shan States to Burmah Proper. It is however in my opinion little better than the south or Tsin-doung road that we took on our way up. The centre or Tapray road is said to be the worst and the one least used by the Shan traders. On the Ilhne Dek road there is certainly only one very large hill to cross but then for nearly one entire march, the road follows the course of a large stream dry at this time of the year. The bed of this stream consists of large loose boulders of rock the passage between some of them being scarcely sufficient to allow a bullock to get through during the rains this road is of course impassable.

There is one other road that may be mentioned and that is the one from Toungoo to Molayai through the Oiiko country. As I have stated in former reports if the wall of the Molayai could be reached there would be little difficulty in constructing a tramway from the fort. Then road; but from in punes made by the season and last I am informed that this road is worse than any of the older roads by which I have

passed to and from the Shan States. The direct Mandalay and Thein-nee route I also believe to be impracticable.

Left Yemaithin on the 26th, arrived at Ningyan on the 29th April, and Toungoo on the 6th May, having been absent exactly five months, during which time we marched upwards of 1,000 miles. As a proof of the healthiness of the climate of the Shan States, I may mention that during the journey scarcely a single case of sickness occurred amongst our party until the rains came on towards the middle of April.

(Signed) C. E. WATSON, CAPTAIN,

SHOAI GHEEN, }  
20th June 1865. }

*Asst Commr, British Burmah,  
In charge of the Salween Expedition.*

# REPORT

ON THE

## *Nature of the Country passed through by the Expedition to the SALween and the result of the observations at the river as to its NAVIGABILITY with METEOROLOGICAL TABLES and a ROUTE MAP—By FRANCIS FEDDEN, A.R.A.M., Geological Survey of India*

Starting from Toungoo\* in Latitude  $18^{\circ} 56'$  north and Longitude about  $96^{\circ} 30'$  east we proceeded in a northerly direction up the west side of the valley of the Sittang towards the town of Nym gyau. The road from Toungoo through Lay-doung and Toung-yeo-galay bears a little to the west of north passing over an extensive alluvial spread cultivated with rice from Toung-yeo-galay, the road, winding a good deal, has a general bearing rather east of north to Myo-hla the frontier P. lico post villa, a distance of 35 miles from Toungoo, and 5 miles short of the boundary pillar.

About four miles from Toung-yeo-galay the Ssu Lhyoung crosses a broad stream with steep alluvial banks and a short distance beyond the road passes over "Endain" ground—fine sands, argillaceous mottled also gravelly and ferruginous in places where imperfect laterite is forming.—This undulating sandy country extends westward to the foot of the Iegu Leoma hills distant about 10 or 20 miles, while to the east the flat paddy land spreads out to the base of the high range beyond the Sittang River. The road continues passing over, or skirting along, the sandy ground, descending occasionally on to the alluvium.

Rather more than a mile north of the pillar we pass the first Burmese out post called Lin ben vay-dwet; crossing a small stream and its valley we ascend on to a plateau of fine white sand with here and there lateritic gravel. At about 5 miles north of the pillar the road turns to the west and north west over undulating country—arenaceous waste land—till within a short distance of the Thongdan goo Trakahn ("halting place") on the bank of the Thongdan stream, a tributary of the Sittang; here we are on low level fertile land that extends along the banks to the great alluvial spread in the main valley and from this Trakahn to Nym gyau Myo a distance of about nine miles in a N. N. E. direction the greater part of the ground is under rice cultivation.

Nym gyau is not apparently a large town for the Governor of the district who resides here had lately removed the town to the north to the south and higher bank of the Krout Lhy stream and many of the inhabitants had not yet built up houses. The Kyauk Lhyet is a very broad bedded stream but in December the water was quite shallow; about 6 miles down it joins the Tien thay or Shway Myo, a larger stream that flows into the Sittang at Tienthay wa yau. Here at Nym-gyan no teak timber was lying about, and it was reported that there were no teak woods of large size in the stream, but owing to the partial draft by the small boats it is

Crossing the Kyouk-khyet Khyoung we leave the Nyin-gyan district and enter that of Yé-mé-then, and now we are out of the main valley of the Sittang, indeed, from what I could learn from the natives, it appears that the Sittang River or Poung-loung Khyoung as it is here called, has no open valley above this latitude, but is merely a mountain stream running between high ranges of hills

The road from Nyin-gyan Myo continues on as before in a northerly direction, passing over or skirting along the eastern boundary of the Endain ground, now and again descending on to the flat alluvial soil. The hills to the east appear much closer, and I was told that the first range at least was on the west side of the Sittang or Poung-loung. The Pegu Yeoma to our west are almost lost in the distance. On reaching Shway Myo, the Tsenthey or Shway-Myo stream is within half a mile to the right, and a few miles in front, where it is running from the west over a broad sandy bed, it is easily forded.

The country to the north being more fertile is more populous and the villages are larger, we pass through Tay-gong, Tâ-kong, Men-yuay, Oun-gyee-gong and many others, bearing to the west of north on through Neoung-gnâ-ben and Neoung-hloot, both large villages, to Ouk-douk. Most of this ground is under cultivation, the country about the latter villages, gently undulating arenaceous ground with open bushy jungle and short dry grass, is cultivated only in patches, but more especially on the lower argillaceous soil bordering the sandy ground and in the vicinity of the water-courses between the undulations.

From Ouk-douk the road passes over a plain scattered with trees and bushes, this plain extends up to the town of Yé-mé-then, and is almost wholly cultivated with rice, except to the eastward, where it is marshy, and nothing but sedge grows. This low swampy part is bounded across near the town, forming a tank or "jheel" of 3 miles in length, the bund, its greatest breadth, is more than a mile long.

The town of Yé-mé-then or rather "Yé-mé-zin" (as the Tsikee of the district writes it) is enclosed within a stockade surrounded by a neglected mote, there is one very broad main street running through from the north to the south gate, nearly a mile in length. The great plain around Yé-mé-then is about 10 or 12 miles across, and widening towards the north extends up to Mandalay, or at least to the valley of the Myid-Ngé. The site of Yé-mé-then appears to be the anticlinal or highest part of the low level alluvial ground, for, in the rainy season, when the water of the jheel drained from the hills overflows, it runs off on either side, north and south, by the Sammong and the Guawine streams respectively, the former into the Panloung and to the Myid-Ngé, and thence to the Liawaddee, and the latter into the Tsen-they, which joins the Poung-loung or Sittang River.

The source of the Poung-loung and that of the Panloung are said to be near each other, separated only by a water shed called the Tsin-doung a prominent hill in a direction to the north of east from Yé-mé-then.

Seen from 16 mi-then, the Pegu range is but just visible above the angle of the plain, and apparently a slight ridge of no great height, but it is a good way off, some 20 miles or so. The hills on the east are nearer, and we can now distinguish several ranges, between some of them the Sittang or Poungh-loung is said to run. The nearest range, distant 5 or 6 miles, diminishes in height towards the north, where it ultimately terminates, to the south it is broken about the latitude of Nyu gyan, where the Tsenthy joins the Poungh loung.

It may here be remarked that whereas at Rangoon the Aneroid Barometers stood at 29.940 at the level of the river Thermometer 80, at Toungoo they had fallen to 29.763, Thermometer 76°, and in proceeding north they gradually fell, till at 16 mi-then the average of several days' readings shows a fall of more than six tenths of an inch since leaving Rangoon thus indicating an elevation of about 550 feet. The two aneroids here however, do not read the same though their difference is very constant during the fluctuations. The average of the one C is 29.33 and of the other D 29.27. The highest reading was on the morning of the 26th December at 9 A u D 29.35 Therm 66° and the lowest on 27th December at 0.25 r u D 29.22, Therm 67.

				13 difference
26th December at 9	4	u	C 29.11	
27th December at 0.25	r	u	C 29.28	

13 difference \*

The elevation of 16 mi-then estimated from observations of the boiling point Thermometer is about 3.0 feet + but I think nearer the truth this would give a proportion of not quite 2 feet rise per mile (16 mi-then being about 250 miles from the mouth of the Sittang). As might be presumed, it is a higher rate than in the valley of the Irawaddeo (where the inclination is estimated at one foot per mile) otherwise the drainage north of 16 mi-then could never reach the Irawaddeo in the way it does.

There are three roads from 16 mi-then into the Shan States, one bearing due east another to the north-east and a third, by which we went, between the other two; this road is the most frequented, being con-

sidered the best, it bears nearly N. E. for the first three marches, and then winds about to eastward for the next four marches.

A better idea I think of the road over the hills will be gained if I copy briefly my notes on these seven marches.

*First march* — About six miles from the town of Yé-mé-thu, having crossed the great rice plain, the road passed on the north side of a prominent little hill of an isolated mass of granite, a short distance from the range to the east, the rock varies from felspathic, often with large crystals, but little mica, to schistose and even into gneiss, huge detached masses are lying about on the slopes. This little hill named Shway-myin-din is surmounted by a number of pagodas and masonry, from the top there is a fine bird's-eye view of the immense expanse of low country sweeping round from the north to west and south, and bounded only by the distant horizon. The Pegu range, consisting apparently of three ridges, gradually subsides; the northernmost extremity of the first at a point  $5^{\circ}$  N of W; that of the second at about W. N. W., and the third is obscured beyond the second, a faint outline of low hills can be traced in the north-west, and an isolated hill, probably Paop-pa-toung, more to the westward.

From Shway-myin-din the road rises gradually towards the Tsakahn at the base of the first range, passing over detrital ground, angular rock of various hard kinds, also gravels and sands, swept down from the hills.

*Second march* — Starting from the Tsakahn, direction N. E., over irregular broken ground, the ascent soon becomes steep and rocky. The rocks seen *in situ* are chiefly altered sedimentary beds, some vertical with a strike N.  $10^{\circ}$  E and S  $10^{\circ}$  W, also much disturbed, crushed, and irregular, others are schistose, with largely crystallized mica, others are siliceous. After nearly an hour's hard clambering, we arrive upon a tolerably level spot of ground, with a good soil cultivated in part. Here the Aneroid reads 27 36 (Thermometer  $60^{\circ}$ ). Continuing on, a gentle descent along the side of a hill,—we have already crossed one water shed, for the stream on this side runs into the Poung-loung,—the road goes winding among hills making a gradual descent into a vale of some breadth laid out in small paddy fields and gardens, here and there are two or three small villages or collections of houses, a pagoda and a kyoung, this, a good halting place, is called Nong-cway. This valley runs from north to south and is enclosed by a steep hill on the west side, but undulating ground with grass and bush jungle on the east, here I first noticed the common "brake fern" growing luxuriantly. This is at an elevation of 2,000 feet above the sea level, estimated with the Boiling-point Thermometer, and 2120 according to the Aneroid calculations.

*Third march* — Leaving Nong-cway, the road ascends over undulating hilly ground, and along the south side of a very steep hill descends into a vale, crosses a small stream of water, and ascends again steeply, then more gradually, along the top of a ridge. The rocks are light coloured, soft sandstones, also bright red and variegated marly beds, broken and

much disturbed. Continuing east along the north side of a hill, the rocks become more argillaceous, and some are traversed by veins of white quartz. We ascend a spur to N E. and N with deep rales on either side occasional glimpses only through the thick jungle are obtained of the ranges of hills and high points to the eastward. Descending and ascending along the top of a ridge we reach a high point, and I take a bearing on a prominent peak to N W. leaving this high point we descend considerably, and then ascend again to another and higher point where the Aneroid reads 26.98 (Therm. 71°), showing an elevation of more than 3,000 feet. From this we descend again rapidly eastward having gone down a considerable depth we pass along a level bit to another hill that we ascend and get on to a ridge going along still ascending for a considerable distance then rounding a big hill (Aneroid 26.30 Therm. 70°) descend again steeply to where the Aneroid Barom. reads 26.69, now begin to ascend again first gradually, then mounting a very steep bit we reach the camping place "Neung-keo-douk Tsakahn." This march was about 8 or 9 miles but I should say not more than 4 or 5, as the crow flies. Though we started from Nang-eway at 7 A. M., we did not reach this Tsakahn till past 12 o'clock. The elevation according to the R. P. Therm. is 2,860 feet above sea level and according to Aneroids 2,960 feet.

*Fourth march* — Leaving Neung-keo-douk Tsakahn we ascend in a south-east direction the steep side of a big hill, and turning E. N. E. go along the north side of a very high point (Barometer 26.12 Thermometer 60°, = 3400 feet.) The rocks are the same as before, softish red marl varying more or less argillaceous or sandy, no hard rock was seen. From this point the road begins to descend along the top of a sharp ridge or spur, from which a good view of the hills in front is obtained the valley of the Peung loung lies below with dense fog resting at the bottom, giving it the appearance of a winding lake with many little hilly islands. Descending from the high hill we reach a short level bit and then descend again on the south west side of a hill on to a connecting part then along the north side of another hill, descending to another connecting bit and again a third another hill go along the north side of high part and then descend first gradually along a spur to north and then a steep and continuous descent to east of north east and south of east the latter part very abrupt and rocky; (beds argillaceous red marl nearly vertical dipping to E. 20° N.) Having got down to where two small hill streams meet the Aneroid Barometer reads 27.02 (Thermometer 73°) thus indicating a descent of 1,700 feet within the last mile or so. We follow down this pretty little stream of sparkling clear water its banks lined with almost every kind of fern (many I recognized as English) winding in an easterly and south-east direction through a thick wooded vale for about two miles, where it turns more to the south and shortly joins the Peung loung. The road goes on easterly over a small hill of red clay with cherry hard beds and even descends into the valley of a big stream about 25 or 30 feet wide running from the

north-northwest, this is the Poung-loung or Sittang. The Tsakahn is a short way up on the right bank, a small level spot of ground with high hills on either side.

The march was about 7 miles; but in a direct line I presume the distance is not more than four.

This Tsakahn is at an elevation of at least 15 hundred feet above the level of the sea, and fully one thousand feet above the plain of Yé-mé-then.

*Fifth march.*—The Poung-loung stream, though fordable by cattle, may be crossed by a very rickety tumble-down bridge of bamboo. The road directly from the left bank ascends up a steep hill eastward, and it is a hard climb of 15 minutes to reach the top, we continue to ascend in a direction nearly S E along a ridge with deep valleys on either side, to the left across the valley is a high jagged range running nearly parallel to the one we are on, having passed the highest part we descend the side to eastward, and go along a spur or branch of the first range we ascended, it apparently connects with the other high jagged one. Now we ascend along east side of hill or spur and reach a narrow connecting part where we can hear the Poung-loung stream noisily rushing down in the valley below. We ascend a hill to east and continue ascending steeply to E N E along its brow going towards the high rocky range, the stream is still heard in the valley below, but without crossing it we enter a sort of gorge or pass and proceed up a dry water course to S S E, here there is much limestone about, none was seen in situ, the ground is red clay with gravel, but continuing on in a straight line down a dry water course, we pass rugged masses of limestone, towering up on either side, and the soil here is a rich black loam. Just beyond in the hollow of this gully is a hole, into which the water during the rains must drain and join some under-ground stream. It is impossible to trace the system, if there be any, of these hilly regions, while marching across hastily an extensive view is so rarely obtained. The road goes S S W for a short distance between high hills as before, but now more open, then it turns S E, continuing on a level, then ascends gradually E 15° N the side of a gully, the hills here are wholly of limestone, very cheery in part, and covered with rich dark coloured soil following up a rocky watercourse we shortly descend again, still bearing east in this vale or gully (where the rushing of water is heard below), and soon came out on to an open grassy swaid with huge wall-like hills of limestone on either of the three irregular sides, the summits of the hills crowned with rugged cliffs and bluffs, grandly picturesque. We have now arrived at the Tsin-doung-kee Tsakahn ("Foot-of-the-Elephant-hill"), the great axis of the range, and here is the source of the Poung-loung or Sittang River. It takes its rise in this hollow, or valley, and is continued by an under-ground passage through the hill we have crossed.

Elevation by Aneroid (c), 2,785 feet, Aneroid (d), 2,415 feet, above sea level.

*Sixth march* — This march was spent in clambering up the big hill in a steep and zigzag fashion; the ground is very rocky, masses and pebbles of limestone well rounded and water worn in holes and cavities. The road crosses over the lower and more southern part of the Tsin-doung-gye and then continues on easterly along a spur or ridge, a short way to the Tsin-doung-kite or tate Trakahn ("Halting place adjacent to or upon the Elephant hill"). But before arriving at the Trakahn, I made for the top of the hill ascending by a spur, and then continued along the main ridge till I reached one of the highest rocky peaks composed of a rugged mass of loose fragments of weathered limestone all along the crest of the hill there is but a scanty sprinkling of soil and the rough blocks and lumps projecting above the long grass give the appearance of vertical rock, though no bedding was discernible. At noon on the summit of this rocky heap, (with a cold cutting wind blowing up the north east side) the Thermometers stood at (a) 51 7, (c) 52, and (d) (spirit) 47 7; Barometer (D) 24.600 and water boils at about 203 & thus indicating an elevation by the one (Be. Pt) of 4,780 feet, and by the other (Barometer) of 4,900 feet above the sea level, and an ascent from the foot of the hill of 2,300 feet, and 3,070 feet above the Poungh Loung Trakahn. This peak is in latitude 20° 30' 50" North.

The Tsin-doung-gye range is the natural boundary between Burmah Proper and the Shan States. Viewing the hill scenery, which is very grand, from this elevated point it is difficult to make out any system or determine the main water sheds, the appearance is that of a sea of irregular and broken hills (their strike is about north and south, or rather N N W and S S E.) Lay byin Loung a very lofty hill, is visible a long way off to the north north west, and Myin-ma-te Loung a prominent rocky bluff, distant nine or ten miles to the north-east. There is a large and conspicuous pagoda called Shway myin bone, (said to be equal in size to the Shway-dagon) built on the summit of a hill in the great valley that sweeps down to the north.\*

*Seventh march* — Although this camping ground, ' Tsin-doung-tate Trakahn, is literally within the Shan States, there remains yet one more hilly march before we are fairly into the country. On the morning of this day's march (5th January) I observed for the first time a white frost on the damp exposed parts. A piercingly cold wind was blowing from the north-east, yet the Thermometer suspended outside the tent showed a temperature at 8.16 a. m. of Therm. (a) 41 & (c) 46 &

Leaving this camping ground the road bearing first to the north of east and then east, winds round to the big hill called That-doung

During the last two months I collected from almost the entire range a large num-  
ber of beetles. I put on the whole of my oil skin bag but lost the last few to the  
cold. At our first night I had to sleep in my oil bag. The oil was so  
cold and stiff it was impossible to sleep in and got a little of the  
oil out and it is provided in a small oil skin bag. This bag was  
filled with oil and I laid it under a peat in the Jardine's oil skin.

observed yesterday from the summit of Tsin-doung as intercepting the view to the east ; it appears to be almost, if not quite, as high as the latter, for at 7 o'clock the Aneroid reads (D.) 24.60, Thermometer 41°. We have already left the limestone rocks, and are now on a series of argillaceous and sandy beds, comprising a fine-grained incoherent sandstone of a light yellow color also reddish and earthy, some harder beds appear nearly vertical, striking N. 15° E. and S. 15° W, others again argillaceous and chalky, with layers of pipe clay, called by Burmans "mca-thin-gé," these beds are also vertical, their strike runs N. 30° W and S. 30° E.

From this hill a better view is obtained of the great expanse of country now before us, a panorama of cultivated land and open downs, with hill and dale in repeated succession, the higher ranges forming the great water sheds between the main valleys, these appear to run very regularly north and south. On a clear day, the great Neoungyuay lake is said to be partially visible from this hill, distant some twenty-five or thirty miles in a south-east direction. Leaving this hill, the road makes a continuous and winding descent, over broken stony ground on to more gentle slopes and open undulating downs, covered with short grass and bushy fir trees, the road still descending, but gradually, in a north-east direction until it reaches the camping ground in the valley near a village called Toun-hla. This is in latitude 20° 32' 30", and at an elevation of more than three thousand five hundred feet.

There are several small villages scattered above and below in this valley, and here we at once notice an appearance of more industry in agriculture than is generally seen in Burmah. The land is systematically drained and irrigated, for there is but a small supply of water, and that is husbanded and applied in a most economical manner. For example, the rich earthy slopes on either side of any little stream or trickling, are levelled after the manner of a broad irregular flight of steps, and the edges banded so that the water, when required, is let on from above and caused to meander from one step or little enclosure to another, till it finally reaches the lowest, where it is generally collected, by a bund across the vale, into a tank, and the surplus water overflowing through bamboo spouts constitutes the public lavatory. This capital bathing arrangement may be found at almost every village and town where there is a stream adaptable for the purpose.

The small stream or rivulet in this Toun-hla Valley is here flowing to the north, but further down it winds to the right, and bending round runs southward down the main valley into the Neoung-yuay-En. This Toun-hla Valley is enclosed along the east side by a steep scarp and rocky face consisting of beds of a fine grained reddish sandstone of no great hardness, though the bedding is well preserved, the dip is E 15° N. < 35°, overlying these is a thick bed of calcareous breccia,\* the fragments contained being often large. There was said to be much limestone also out

\* This limestone breccia occurs again at Pavin-doung hill, in the north north-east, Myin-ma-te-toung is also composed of a similar calcareous rock.

to the eastward. At the base of this scarp, near the village there is a calcareous, or so-called 'petrifying' spring and the ground round about it consists of calcareous tufa deposited from the water. This tufa is worked and much used in the building of pagodas &c.

The Toun bla District does not extend eastward beyond the little ridge is the Pan loon Vale and then beyond a highish ridge of hill is said to be the La mine District, then east of that the Pay mee and Baw nen and then the Neoung yuay.

The high road to That nee lies through Kyouktat, a large town three short marches to the north north-east but in a straight line as on the map 21 miles only from Toun bla. Proceeding down the valley for about a mile and a half the road turns up the east side at Sha ben yua, and continues on over irregular ground towards the foot of a very prominent hill with high rocky bluffs called Myin-ma te-toung; skirting along on the eastern side, we reach the village of the same name then passing over cultivated land and open downs we again meet the Toun bla stream now running from the north-west. It is crossed by a good timber bridge there is some rock on its left bank, the same ferruginous limestone as that of Tain-doung. We now pass over a broad stretch of tolerably level country, grassy downs with small rakes and a few baches, interrupted by the flat alluvial ground lining the banks of the streams. The drainage of two tributary valleys, the one from the north from Pway bla and the other from the north-west (separated at first by irregular hill or uplands), here meet and joining the Toun bla stream, runs down south through the great plain of the main valley. There are many large villages here about as Na-an, Oum Lan, Thamma Lan, and others. The landscape around is nowhere to be found in Legu or Burmah, and reminds one strikingly of the downs of England or the farm land of Devon. The soil is light, very rich and of considerable depth of a light and dark chocolate colour, and with the exception of the more recent clay of the plain is the same all over the States. The greater portion of this land is under cultivation, the labourers turn up the soil with long handled tool and then burn it in heaps and manure it.

A great valley of low country lies to the east. The parts may be called the "Up land" or "Downs" of the Shan States. From the appearance of this ground and the general configuration of the country I conclude that this rich soil is a lacustrine deposit whereas that of the plains and the flat stream banks is a deposit of more recent date probably fluvial.

After passing Thamma Lan, the high road continues in a north-north-east direction across to over higher land from which looking east the champaign country in the great valley on the right, the high ranges of hills are more discernible. The Mue Dint lies almost to the east of them and turning to the west the great barrier of the Shan States lies impressively across.

The high road from Tin-gyay-gyat passes through an avenue of trees, and is hedged in on either side for some distance

The plain of the great valley on the right appears to terminate about this latitude, the valley being continued on northerly in gentle undulations, and secondaries or tributary vales obscured from view by their jungle.

Kyouktat is a large town or rather overgrown village, and one of the most populous in the States. Here there are some smelting works of argentiferous galena that occurs in the limestones and calcareous deposits of this district, but it was impossible to ascertain from the natives the precise localities where it was got. The ore\* is purchased by the smelter at the rate of two to three-and-a-half tickels of silver ("baw") per basket measure (about a bushel) of ore, uncleaned, often containing a good deal of rubbish apparently; it must be rich however in silver, or this metal could not be extracted by the simple and rude method practised

The larger lumps being broken up, the ore is first put into a small cupola or blast-furnace, together with charcoal and a proportion of broken slag. These cupolas are of clay and built upon the ground two and a half or three feet in height, and 14 to 16 inches in diameter, women are employed standing on raised platforms to pump the blast, generally two to each furnace, as the sulphur is driven off, the reduced metal accumulates at the bottom of the furnace, and is ladled or rather scraped out from below, (the scoria being removed,) into moulds in the ground, where it assumes the form of massive lenticular ingots, when cool and set these ingots are removed to the refining shed, and placed into small reverberatory furnaces, with the fuel, large pieces of charcoal supported on fire-clay-bars above the metal, which is thus kept in a fused state for about 24 hours; during this time, as the lead becomes oxidized, it is removed by gently revolving over the surface an iron rod around which the lead in the form of litharge solidifies, and as this process is continued, it accumulates in a number of coatings or layers one upon the other. When all the lead has been thus removed, the silver residue is taken out as a button or plate on an iron ladle. The rollers of litharge have of course to be again reduced, in order to convert them in metallic lead, and there must be a considerable loss of the metal during this as well as the former process.

The plate of silver obtained is considered pure, and is not used in this state as currency, but is sold to the silversmiths and jewelleis, who alloy it with copper and lead, in various proportions.

The smelter at Kyouktat also buys up the argentiferous and cupiferous lead residue from the silversmiths' forges, and extracts the several metals in his furnaces

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\*Specimens of this ore accompany the Report

This lead ore occurs not only in the Kyauktat, but also in the districts of Pendayah and Bawzan in the north west and north

The scenery in these parts, especially in the Pen-dayn valley, is about the most picturesque in the Shan States; cultivated fields, open downs, and hillocks sparsely with bushes, the many villages with their Kyoungs encircled with jungle clumps, white and gilded pagodes clustered in the vales or tapering upon the summit of every prominent point on the western hills that rise towards the north into a rugged mountain range, the azure mist of the valleys intervening, the whole makes up a very pleasing landscape.

Leaving Té-thone, a large village about 9 miles to the north from Kyauktat we went rather a round about way to reach Mine-byin Myo; instead of bearing east-north-east, we continued another march to the north, keeping up on the high land that forms the water-shed between the drainage of the Neoung-yuay lake and that of the Myid Ngé; we pass over a good deal of irregular and rocky ground, the out crops of semi-crystalline limestone and other beds projecting through the scant soil have waterworn and smooth surfaces, they are dipping to S 30°-40° E < 35-40° there is little cultivation about here and the hills are covered with jungle I could see but little of the conformation of the country till descending on the second march from Té-thone. The first part of this second day's march, a very long one, some 18 miles, was a general descent over waste land covered with jungle, then continuing on in an easterly direction, we pass through the low country and on to the plain of the great Mine-byin valley the soil of this plain is a stiff alluvial clay of a peculiar lead grey or slate color. When within a mile of the town we cross the Nat-ee Khyoung by a substantial timber bridge, this rivulet is the largest yet seen in the Shan country, for in the districts hitherto passed through, there was a comparative scarcity of water and must be very much so in the latter part of the dry season the Nat-ee is said to take its rise from a large sheet or swampy lake up the valley to the south there is a considerable body of water of a bluish color, but beautifully clear, flowing between steep banks and over a rocky bed with many noisy falls and rapids it runs to the north, and joins some other stream that flows into the Myid Ngé. There are also several fine tanks of water in the neighbourhood of the town, which is situated on the low country bordering the east side of the alluvial plain. Mine-byin Myo is in Latitudo (estimated) 21° 5' N Longitude (assumed) about 96° 45' E. and is at an elevation of 2,045 feet by the boiling point, and 2,400 by the Anerondu. This is about fourteen hundred feet lower than the Town hla Valley

From Mine-byin the most direct road to Thau nee Myo would be to continue down this valley northward to Youk zouk, thence to Thong zé, and on to Thau nee. But we directed our course to the town of Le-deah, which lies to the east-north-east, taking five marches to reach there. In the second march from Mine-byin, we cross a high water-shed and descend

among a number of little vales and streams that run into the valley of the Nam-pōn. This large stream flows down towards Moné and ultimately joins the Salween River.

The rocky ridge of hill just crossed is more than 1,200 feet above the Mine-byin Valley, it forms the boundary between that and the Moné district.

All these little vales down on the east side are laid out in miniature paddy fields, irrigated in the manner previously described, the soil here is very rich, and the hilly downs and uncultivated parts are covered with short grass and the brake fern, also few bushes or trees, the higher hills are wooded with firs and other ever-greens.

There are many villages about, the two largest seen being Pen-zu and Nattit. These places are about 3,300 feet above the level of the sea, or 900 feet above the Mine-byin Valley. Now I must endeavour to describe the hilly mass that has to be crossed in going from Nattit to Lé-deah. The hills tower up range upon range to a height of some 5,000 feet above the sea level, 2,500 feet above the Mine-byin Valley on the one side, and 2,070 feet above the valley of Lé-deah on the other, these figures show the difference of levels, nearly 500 feet, between the two valleys. The ranges strike about north and south, and towards the north the main ridge, constituting the great water-shed or boundary between the drainage of the Myid-Ngé and that of the Salween, continues on in an unbroken line for some 70 or 80 miles, where in latitude  $22^{\circ}20'$  it is interrupted by a valley of low country.

The rocks of these hills are for the most part shaly, of a reddish yellow color, also mottled pink and white, and purple arenaceous shales and clay-stones, varying to cherty, white quartz also occurs in these beds. On the eastern side, beds of sandstones predominate, parts of which are very micaceous, passing into mica-schist with wavy foliations, and in the highest hill to the east of Nattit I observed a gneissic rock of disintegrating felspar and quartz.

From Nattit there are two roads to Lé-deah, the one to the north called the "monsoon road," ("modwin lán"), ascends the side and winds along the top of the great water-shed till, arriving at the latitude of Lé-deah, it makes a very precipitous and long descent to the bank of the Nam-pōn at Neoum-ben-yua, then, without crossing, the road bends round northward, and turning to east passes over three minor ridges of hill into the Lé-deah Valley.

The direct road bears E N E from Nattit, passing over a series of hills by more gentle ascents and descents, though much intercepted by streams that render this road impracticable during the rainy season. The Pōn-Khyoung is crossed and re-crossed several times, at Nam-shain village, one march from Lé-deah Myo, it runs through a broad and fertile valley to the north, where it is joined by another stream and vale from the north-north-west, then bending round to westward, its valley

becomes irregular, and again to the south very contracted from Neoung ben and Bambway gong to Nattit this stream runs through narrow gorges between lofty hills, occasionally opening out into little circular patches of paddy fields. Its course throughout presents the idea of there having been formerly a number of hill bound lakes, running into each other this most probably was the case not only in that of the Nam-pōn, but in very many, if not all, of the stream courses throughout the Shan States. Immense freshwater lakes separated by the more lofty ranges of the hills; (—the Neoung-yuay lake for example or the lakes of Scot land,—) as the land was gradually elevated, the lakes divided up into many smaller, connected only by their streams and rivers, which in the course of time drained the lakes by deepening their own channels and cutting their way through the rocks. The valley at Mine-kine, in the north, is a good illustration looking down from any of the surrounding heights one cannot be otherwise persuaded but that it was formerly a great lake, for it is enclosed among hills, and its stream has to find its way out on the north side passing through deep and rocky gorges, or passes, until it reaches the open country of the Lé-deah valley where, turning southward, it runs down on the east side of the town and continues its course towards the Salween.

Lé-deah Myo like many other of the large towns in the Shan States was formerly of much greater importance owing to local disturbances quarrels among the native chiefs and other causes, this once flourishing town now comprises barely two hundred houses. The <sup>big</sup> street or main road through the town is very broad and nearly half a mile long; it runs east and west, with cross-roads at either end. The houses are small and low as all Shan houses generally are, with little gardens and irregular enclosures around them. The town itself is enclosed by an embankment on the north side and a moat on the south; a stream runs along the west side, and a large tank bounds the east.

Lé-deah town is in latitude (estimated)  $21^{\circ}10'19''$ , and longitude (assumed about)  $97^{\circ}30'$  Elevation (by boiling point) 2,010 feet, (by Aneroids) 2,895 feet.

The small stream along the west side of the town runs up north for a short distance and then joins the main stream of the valley, the Nam tain or 'Thein Khyoung,' a very broad and swift flowing rivulet that takes its rise among the high hills south west of Mine kine called Lōi tain pa and Tindoung (the people inhabiting these hills are of the Pa loung tribe they cultivate the poppy and manufacture opium). The Nam tain after getting out of the Mine-kine valley as before stated runs south draining the great Lé-deah valley towards the Salween River.

From Lé-deah the Salween is about 70 miles in a straight line due east. There is a good road down to the Tā-caw ferry it passes over a great common and gently undulating open downs, and when at 10 miles from the town (Lé-deah) the road passes up a sloping scarp that runs north and south on to another great spread of undulating country devoid

of jungle. Fifteen miles further on, the road ascends another scarp, and about four or five miles further, again rises and winds among cliffs and rocky isolated bluffs of limestone, having passed this somewhat hilly ground, the road begins to descend, and when at rather more than forty miles from Lé-deah, the descent becomes much steeper, the latter part through thick jungle, till the narrow valley of the Nam-pan is reached, the bed of this valley is nearly thirteen hundred feet\* lower than Lé-deah, and rather more than 700 feet† above the level of the Salween water at Tâ-caw.

The Readings of the Aneroids were as follows —

Lé deah	(C) 26 620	(D) 26 667	Thermometer 46°	5 o'clock	A M
Simone (E of Lé-deah)	„ 27 128	„ 27 07	„ 65°	5 „	A M
Nam-pan (E of Simone)	„ 28 182	„ 27 995	„ 64°	5 „	A M
Top of range (E of Nam-pan)	„ 26 872	„ 26 847	„ 80°	10 40 „	A M
Tâ-caw ferry (Salween)	„ 29 118	„ 28 836	„ 59°	5-45 „	A M

This Nam-pan or "Ben-Khyoung," as it is called by Burmans, is the largest of any we saw in the Shan States, where met in the north it is a deep stream and must be quite a river during the rains, running over a pebbly and sandy bottom, but here at Kong-hai it is spread out as a shallow lake, nearly half a mile broad in places, with low banks and islands covered with trees and jungle, its water, though beautifully clear and of uniform depth throughout, has a peculiar blue color arising probably from the large amount of salts of lime contained in solution, indeed the whole surface of its bed is of "travertin," a calcareous deposit. The current here is scarcely perceptible, but where the water flows in there are broad interrupted falls of several feet on either side of a small island, and the scenery here is extremely pretty. I was informed that the river retains the same lake-like appearance for a long way to the south, interrupted only by falls here and there, and that it joins the Salween near the town of Mo-né.

From Kong-hai village on the east side of the Nam-pan there are yet two marches before reaching Tâ-caw, the first march and half the second is spent in mounting up by a series of slopes and steep ascending scarps to a height of twelve hundred feet near the top, the road avoids one rugged ridge by rounding its northern extremity, and then continues on to the brow of the mountain, from which it descends very steeply to the Salween River bank, a depth of nearly two thousand feet ‡. This range of hills is covered with dense forest jungle on the east side, but the more level parts and the slopes on the west have been cleared, and are mostly under cultivation, we passed through a large orange garden on these hills.

But to return to Lé-deah, for there are yet some hundreds of miles to review before arriving at the spot where we first struck the Salween

\* Mean of calculations, 1 287 feet

† Mean of calculations, 748 feet

‡ Mean of calculations, 1,963 feet

Proceeding rather east of north from Lé-deah, we pass over a very high water-shed, into the Mine-kine valley follow down in the valley for some distance, and then ascend to northward on to high regions again in the valley and on the ascent, very many streams of water were crossed but among these truncated hill tops, much of the drainage is into hollows and holes, and thence is continued under ground.

These elevated parts are clad with long grass fern brakes, and in part woods of fir and other trees. To the westward three steep and lofty ranges are visible running apparently N N W and S S. E.

At Ban-sam (or Bán zám) we have descended to a level rather below that of the Mine-kine valley but still above Lé-deah here we meet a broad and noisy brook, rushing impetuously along its rocky bed. At the first sight of this stream I thought I recognized an old friend from Mine-kine but our learned guide and others assured us that we had not seen it before this being the case I have little idea as to where this body of water has its source. This brook, called Nalloung is here joined by the Kéa hom Stream it runs to north-east passing by Bán-woot, and then bending round to the south-east joins the great Ben Khyoung.

But before reaching Bán sam, we have passed a hot spring about seven or eight miles from the town, and near the village of Bán pón this spring rises at the side of a mountain stream the water is very clear and as it issues at a temperature of 104 Fht., has a different specific gravity from that of the cold stream into which it flows (mixing like spirits with water) Where gas is issuing from below the thermometer goes up to 128 and 130, leading me to suppose that these bubbles are of steam.

In the same stream, not far from this spot, the natives occasionally wash for gold near the village of Kéa hom. The rocks in the neighbourhood are shaly sandstones also fine grained silty beds, crushed and somewhat shistose, they are dipping to the south-east at high angles.

Again within a mile of the town of Ban-sam, there are several springs of hot water rising in the low ground west of the Nalloung Khyoung. The two largest are close on the side of the brook and about a hundred yards apart there is a very considerable discharge of water issuing at a temperature of 82 and 83 respectively from limestone rock largely crystalline and encrusted over the surface with a calcareous deposit from the water. The temperature of the brook above the influence of these two springs, was at 7 A. M 66 5 whereas the temperature of the air was only 51. This tepidity arises partly from the influence of a pleasantly warm stream that flows into the brook a short way above on the east side indeed most of the streams throughout this district are tepid more or less they are strongly calcareous, and deposit lime in the form of "tuff" or travertin extensive beds of this travertin occur all over the country especially in the vicinity of the limestone in several places it is worked in open quarries and used for building purposes.

After leaving Ban-sam the country passed through is less hilly than hitherto To Bán woot by the direct road is one day's journey but,

( for certain reasons I need not here narrate,) we took one march to the east, passing over bushy and ferny downs, and cleared grassy slopes and gentle undulations covered with a rich light red soil much cultivated, and divided into broad valleys by a low range of hillocks, and the remnants, as it were, of a rocky limestone ridge, left in little bluffs and peaks of crystalline limestone , these low anticlinals strike about north and south Having arrived at Hentone bazaar, our first halting place from Bân-sâm, we strike across country to Kain-loon in the north-east passing over low ground and a general common \*. There are no high hills seen about here either to the east or west , north of Kain-loon there is a hill, but of no great height, over which we pass on to open country again, and, descending gradually, shortly come to the small town of Ban-woot we are now in the Thaïnee district, and bending our course to Lâ-sheoo

Crossing the Nalloung Khyoung (here about 80 feet broad, and may justly be termed a small river, as it is scarcely fordable by loaded bullocks), we ascend over downs and commons, similar to those previously mentioned, for about twelve miles more, when we descend on to lower and a more level spread of open champaign country through which the Nam-â-lâ Khyoung flows from the north-west to south-east , here it is joined by many small streams from the westward, and also from the hilly mass on the north side of this stream , we then proceed up the valley, and rounding the big hill, called " Lôî-Sim-oo," arrive at the large village of Mine-zaik, situated in a small vale from the north, not more than a mile across, and bounded on either side by low hills steeply scarped towards the valley Far off to the westward many long ranges are visible, and I was told that Thee-baw lies to the west-south-west, distant about 20 or 30 miles

Proceeding from Mine-zaik in a northerly direction, we ascend over higher ground beyond the valley, and having gone about three miles we arrive at the brow, beyond which is a considerable depression almost a precipice, from here we see in front great wooded valleys, (country of a much lower level than what we have passed,) and beyond again high ranges stretching out east and west across the landscape, and shutting out all view of the country further to the north. The whole of the land now before us drains into the Myid-Ngé

Following down the steep descent on to more level ground, we pass the villages of Nan-goo-san and Pâ-sheng, and then descend again through thick jungle along the west side of a deep vale with a noisy stream below, that runs northward , and again pass over undulating country covered with jungle , there is also a great valley on the left off to westward, and a high range of hills beyond, distant about six or eight miles

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\* Along the stream courses and hollows of this ground rough weathered masses of the same crystalline limestone are exposed and partially enveloped in the soil, giving the idea that one is passing over the old bottom of a great lake or estuary,

The road still descends often steeply till, on arriving at the Nam ma, it is intercepted by a deep and rocky chasm along which the water rushes impetuously this is an interesting spot the chasm I imagine has been caused in part by a "fault" or dislocation of the rocks, the one side being rather more elevated than the other. In the south side is a very pretty grotto with stalactites pendent from the roof and encrusting the ledges of rock, that are fringed with delicately tinted ferns (*Adiantum*) the deposit of lime is from a calcareous little stream that, percolating through the upper strata falls in a thousand tricklings from the roof the water in the deep hollows of the brook below is of sea-green color This brook, called the Nam ma is here running irregularly from east to west, it is said to join the Nam young some distance below Ban zé.

This is the first bridgeable stream we have come to that has not a substantial bridge across they say there was formerly a good bridge here now there is but a very rickety bamboo arrangement supported upon the long trunk of a felled tree

Having crossed to the north side we ascend and pass over a long rising sweep of country mostly covered with jungle, but towards the north more open and cultivated having made about seven or eight miles of northing we come down on to the flat alluvial banks of the Nam young near the town of Ban zé. This stream is quite a rivulet running very swiftly over its pebbly bed between high banks about a hundred feet apart; the broad valley of this stream is at a lower level than any yet visited in the Shan country being only about 1,000 feet above the level of the sea, and rather more than twelve hundred feet below the Lé-deah valley

It comes from the east or rather north of east and, from Ban zé, goes on in a westerly direction; after receiving the waters of the Nam ma and another called Nam-poo it is said to join the Myid Ngs near the town of Thee-baw

It was reported that gold is washed for in some parts of this Nam young but as usual, on making enquiry on such subjects, the fact is ignored altogether \*

From Ban zé Lé shoo is only fourteen miles on the map, but it requires two severe marches to mount, cross and descend the mass of hills intervening. This high range covered with dense jungle lofty forest trees and rank underwood especially on the south side rises to about eighteen hundred feet above the level of Ban zé; it runs for a long way towards the east north-east but to the westward it appears to break up into irregular hills beyond which are distant ridges running longitudinally

\* I was subsequently informed that gold was much worked at a place called Mine-loon-sop said to be near Ban zé.

† A single frond of *Nephrolepis*, meta are eleven feet in length, the frondlets begin to branch off at 6 feet 4 inches from root, they spread out a width of 3 feet 8 inches. A very big specimen.

‡ Where the road passes, the mean of calculations gives 1,710 feet above Ban zé

Of Lâ-sheoo nothing remains but the stockaded residence of the Governor and his troops, and the disfigured sites of deserted villages; it is situated in the broad valley of the Nammayow stream, beyond which is another high range of hills running east and west the road to Thainee, which town is only about 20 miles distant from Lâ-sheoo, lies across these hills in a north-east direction. That town was also entirely destroyed in the late disturbance

From Thainee, the nearest point on the Salween is said to lie north of that town, but I was also informed that the Myid-Ngé has its source about sixteen miles to the north-east of Thainee, and that it passes close on the west side of the town, little dependence however can be placed on such reports, for the so-called Myid-Ngé has another name in these latitudes, indeed there are so many large streams that go to form the river, it is doubtful which of them is the main one.

About six miles to the east of Thainee-myo, there is said to be a poisonous spring, and strewn around it are bones of birds and other small animals, I failed in endeavouring to procure any of the water.

The silver-lead mines are said to be three days' journey beyond Thainee

At Lâ-sheoo there is a large shallow pond of hot water at a temperature of about  $119^{\circ}$  Fht, there are a number of springs in it and gas occasionally bubbles up in many parts one spring, slightly above the present level of the pond into which it flows, shows a temperature of  $124^{\circ}$  on the Thermometer this was at 9 o'clock on the morning of the 21st February, temperature of the air about  $57^{\circ}$  or rather less The water of this pond flows off on the north side and joins the Mam-may-ow stream. Also at Mine-tin up the valley there is a tepid spring in a large swamp In the early morning, large volumes of white vapor may be seen rising from these places, the hot pond especially

The valley of the Nam-may-ow, better known as the Lâ-sheoo valley, is at an elevation of 2,400 feet (nearly) above the sea level, and 750 feet above Ban-zé, being 486 feet\* lower than the Le-deah valley

Our camp was in latitude (estimated)  $22^{\circ} 58' N$  longitude (assumed,) about  $97^{\circ} 30' E$ . With the vain hope of reaching the Salween River at this high latitude, we proceeded westwards up this valley for three marches, first to Mine-tin, second to Mine-yin, and finally to Mine-yaw, here we were very near the head of the valley and within two or three days' march of the Salween (distant less than 30 miles) but it was deemed advisable to retreat to the protection of the Governor at Lâ-sheoo

Before leaving Mine-yaw, however, I made an attempt to reach the summit of a very prominent bluff called Loi-sât, about the highest part on the southern range having ascended to the foot of the crag, and within a few hundred feet of the top, I was prohibited by the people of a large village in the vicinity from proceeding any further, on the plea

\* These figures are the means of a number of calculations

that there was some sacred foot-print above, and that permission must first be obtained from the head man of the town in the valley this was too much of a joke—to descend seven miles for permission and mount again,—so I contented myself by making my observations at the elevation attained which proved to be about 15 to 18 hundred feet above Mine-yaw, and over four thousand feet above the level of the sea.\* Its latitude (estimated) is 23° 50' N, longitude (assumed) about 98 E.

From the summit of the crag, the boundary of the Chinese territory is said to be visible on a clear day. Upon the lesser slopes, where there is rich soil even high up on these hills, the white poppy is grown extensively and in the glens below are large plantations of the sugar-cane. The tribes who cultivate in these hilly regions are the Pa loungs chiefly but also the Kachins and a remarkable people called "Shan Tayohs" (a) from the borders of the China territory.

The scenery around Mine-yaw is beautifully grand it fails me to attempt a description and I must therefore content myself by comparing it to views in Switzerland. The valley contracted below (where the stream, falling over a succession of rapids wanders through deep ravines) here widens out in fertile downs and slopes three or four miles across and was doubtless a great lake originally. This idea is strengthened when viewing a large cascade on the north side of the valley, where the water of a mountain stream coming to an abrupt termination of its bed, falls precipitously, a depth of fifty feet, into the valley.

Having returned to Li-shoo we there determine to try some of the lower roads to the Salween it being doubtful whether these roads are sufficiently open for elephants, we reduce our kit by sending most of the heavy baggage down to Mandalay by way of Thee-baw and Thong-zé and then retrace our steps (making long marches for the season is getting late March 6th) to Mine-zauk from here we branch off to the left, cross a water-shed and descend into the Ban-sin valley.

From Ban-sin we take one march to the east, across open country, downs and cultivated land to Mine-yaw (as there is some difficulty or uncertainty about this road,) we make two marches to the south in order to avoid a high and steep ridge of hill that lies to the east running north and south still journeying through open country we cross several large streams from the north pass through Ban-pé, a very large and struggling village; a low wooded country lies on the west and irregular hills two or three miles to the eastward we shortly arrive at the village of Mine-kha. From Mine-kha we strike east, "across country" (in the true sense of

* By Boiling Point, Mine-yaw above sea	2,300 feet	By Aneroid Mine-yaw above sea 2,533 feet.
By Boiling Point, Hill above Mine-yaw	1,845 "	Hill above Mine-yaw 1,450 "
By Boiling Point, Hill above sea level	4,145	sea level 4,015 "

(a) They are very different from the Moslems who bring caravans from China.

that term) for two marches to another Mine-kha or Mine-khât; the ground passed over in the first of these marches is very irregular and hilly, till on arriving at the bank of a large stream or rather brook, which is crossed by a most ingenious suspension bridge forty feet span, of bamboo supported mainly from the overgrowing trees. This stream comes down from the N N W. along the base of the range that here terminates in a very high hill. On the second march we round the foot of this high hill (in which I observed some masses of trap rock and a purple colored porphyry), and proceeding on, still in an easterly direction, over undulating ground towards another big range, ascend very steeply to the top of a high spur from which is obtained a bird's-eye-view of the hilly country around, but the atmosphere is extremely hazy, arising from the prevalence of jungle fires. \*

Crossing this spur, we come to a very abrupt and steep declivity on the east side, and descend diagonally by a good road cut along the side, into a deep gully, this gully serves as a sort of flood-way during the rains, for the stream that comes down from the hills to the north, now but a small one, here enters a cavity in its bed and is continued underground.

Having crossed the gully we ascend on to high downs or uplands; there is a great conical mountain on the left, distant about two or three miles, here and there are a few villages and several small patches of paddy ground; proceeding on eastward we get off these downs, and then descend into a very large ravine about half a mile wide, at the bottom of which is the great Ben Khyoung, this small river, though of no great depth at this season of the year (16th March) and fordable on horseback, must be very deep during the rains, it is here running from north to south, having crossed we slowly ascend the eastern side of the gorge by a steep winding pathway that leads through a sort of pass on to high downs again, and continuing on we shortly arrive at the second Mine-kha or Mine-khât, in a cultivated vale about half a mile broad, with irregular wooded hills on the east side, this small vale drains to the north-west Mine-khât is about 16 or 18 miles only from the Salween according to report, but this direct road is also denied us; the "Tummong" or head man of the village, however, promises an "illustrious guide", who will actually "take us to the Salween by another, and (?) better road a little further to the south."

We leave Mine-khât, (with our "illustrious guide,") and go south for sixteen miles, passing first up through country of tolerably uniform level, but soon get among irregular wooded hills (few fir trees about), with steep scarps and vales, there is a high range on the right, running about north and south having gone about eight or nine miles from Mine-khât, we begin to descend, here there is a village called Nam-pât, and much cleared ground. At 10 o'clock A M, the Aneroids read (D) 26 174, (C) 26 116, Thermometer 80°

\* Indeed at this season of the year the atmosphere is so thick, the sun quite loses its intensity after 4 o'clock P M and may be gazed at with impunity

The rocks seen about these hills are argillaceous and arenaceous shales and clays mottled and variously colored also much limestone projecting in huge vertical masses mostly water worn the bedding strikes about north and south.

Remarkably few water-courses were seen during this march, indeed the whole drainage of these parts appears to be into hollows and under ground passages.

From Nam pat there are no hills visible for a long way in front but the view is misty and indefinite

Leaving this village, we still bear on southward make an abrupt and zig zag descent down on to low country here the high range on the right terminates, but that on the left is continued on as a precipitous rocky cliff

No water course is met until arriving at a large village called Ho nam ( stream head, ) where a number of springs of sparklingly clear water flowing together form a large stream that continues its course but a few miles in the light of day and then is said to disappear again under ground

At Ho-nam the Aneroids read (at 4 o'clock a. m.) (D) 26.033, (C) 26.988 Thermometer 51 thus showing a descent from Nam pat of about 800 feet.

From Ho-nam we continue in a southerly direction for about four or five miles more over gently undulating cultivated ground also some level paddy land there are hills about, especially on the east, a continuation of the rocky cliff, and a high sugar loaf hill beyond. Turning eastward, we ascend steeply and go winding along the top of a spur again descend and ascend a small but deep ravine where a little stream from the north joins a larger one that flows eastward. Continuing on along the top of a spur or ridge with vales on either side, (the hills appear to run about east and west,) again we go down a very steep descent into a vale here we cross a broad-bedded stream running from the north-east to westward and then ascend and go along the top of an irregular spur (the vale on right drains to westward) continuing on we round the north side of a big hill and shortly make a final descent to the village of Ho-too situated in a small paddy vale its stream the same as the one crossed a short way back is here running from the east north-east

We are now one march from the Salween, but in a straight line due east, I should say the river was not more than three or four miles distant

Ho-too is in latitude (estimated) 21° 08' 45" Its elevation is 2100\* above sea level and about 1300 feet † above the level of the Salween

Mean of calculations—by Aneroid (D)	2,130 feet	by Aneroid (C)	2,380 feet
†	—	—	—
	1,270		1,430
Iteration of river above sea-difference	1,160 ..		9.0
		Mean 1.03 feet	

Although so near the river we can gain but little information concerning it, and that little is vague and unreliable; for instance, they say as to the width of the river "a man can make himself heard on the other side," that there is no traffic on the river except at the ferries, no one will venture down it either, by boat or raft, on account of the water being so "bad", (—swift and disturbed—and the channel very rocky) They also assert that there is no good road along its banks, but merely a difficult track here and there beaten by the *monkeys* and fishermen, and that "very wild tribes, (Lawas and kachins,) inhabit the hill on either side."

Starting from Ho-foo we ascend very steeply the south side of the vale to the ridge top, wind along a short distance and descend into the vale on the other side, the stream of which is running westward; we follow up this narrow vale, cross its stream, and ascend again steeply to east, then move gradually to south-east, a long ascent, to the village of Kam-pōn. Here the reading of the Aneroids at 7-30 A. M. are (D.) 26 705 (C) 26.699, Thermometer 58°.

From Kam-pōn we descend over a small open lawn, and cross a higher part of the same stream we passed a short way back, but here running from the south-west, we ascend and go winding along on hills of no great height apparently, but shortly find ourselves on the brow of a tremendous precipice to the east, turning southward along the top we soon gain the highest point, here at 8 A. M. the Aneroid readings are (D) 26 611 and (C) 26 591, Thermometer 65°

Beyond this precipice nothing is visible save the dense fog resting below, looking down more than a thousand feet into the great abyss, the effect is most peculiar, one might almost fancy he had actually arrived at the unattainable edge of the horizon, or, as it were, the end of the earth.

Here we are about 2,000 feet above the river bed and within, as may be, a stone's throw, or less than a mile at the most

Continuing along this ridge of hill, that runs about north and south, we descend first gradually and then more steeply to south-east by a spur from the main ridge, still descending, now steeply, now gradually, now winding along the sides of hills, our direction is more easterly and often due east as the fog begins to clear a huge range makes its appearance beyond, growing higher and bigger as we descend lower and nearer, and now we catch a glimpse of the river still a long way below us, it looks like a very large hill stream. We reach it at a spot where a mountain torrent from the northwest runs in, and has caused a sand bank to be formed, fifty or sixty feet in thickness above the present level of the river.

The Soo-kāt ferry is not quite half a mile from this spot up the river. There is no village but a house or two on the left bank inhabited by the ferry-men, indeed we could not find a level spot of ground to pitch a small tent, for there are no banks properly so called, the hills

rising directly from the shores of the river, the shores are irregular, and consist of hard rocks with dislocated fragments in heaps and large sand-banks intervening between the more prominent rocky points, this sand, which is of the finest grain, is very incenseous and of a grey colour. Some of the rocks are a kind of obsidian and have the appearance of compact slag as from a furnace; others are encrusted with the same, some beds are shaly, slaty and also chloritic, foliated and contorted others again are hard and siliceous, the several facets of these, indeed the whole of their exposed surfaces, are beautifully polished by the friction of the sands, pebbles are very scarce and only found wedged in the clefts and cavities of the rocks, or as a shingle bank near the mouths of the larger mountain streams. Most of the hard rocks are coated with a peculiar black polish resembling in appearance only, black lead, but is, I believe, an oxide of manganese only.

Soo-kat ferry is in latitude  $21^{\circ} 56' 0''$  N., being about 450 miles from the mouth of the river at Martaban. Its elevation is 1,000\* feet above the sea level, the average inclination therefore of the river bed is about 2 3½ feet per mile.

The shores of the river at Soo-kat are about 240 feet apart at the water's edge, but must be double this distance during the floods that rise to some ninety five feet above the present level in the month of August, the ordinary flood marks were 60 or 65 feet above the present level.

The body of water in the river is here flowing swiftly and turbulently boiling up as it were, in places it is very deep (eight or ten fathoms at the least), for some soundings I took at the shore were over seven fathoms it was impossible to remain out in the stream without strong ropes and anchors.

The ferry men take advantage of a strong back water on the right side where the river is widest; but just above this the channel is contracted by rocks projecting from the right shore, where a two hundred feet cord will reach across again about a quarter of a mile below the ferry, the whole volume of water passes between rocks not a hundred feet apart; here the depth could not be ascertained, the velocity of the current being so great almost a rush, noisily chasing its rock bound channel. But these rocks are only about 20 feet above the present level of the river and must be deeply submerged during the floods they are slaty, and somewhat shistose, and might readily be removed by blasting. The river winds considerably in these parts, and is so shut in by hill that not more than a mile or so is visible from any one point. The natives (ferry men included) would not venture down it, by boat or raft, at any price. They say that coolies can make their way down the left bank for many days' journey, and also up the river for about three days to where there is a ferry, and then the pathway is continued on the right

The actual level of the water at this season (March 2nd) is about 40 feet less; the instruments in the above calculations being at camp on a sand bank.

\* A cord stretched across at the point from rock to rock measured ninety 4½ feet.

bank northerly ; that it does not keep to the river side, but goes inland some distance. I was also informed that above, the stream runs much swifter and more disturbed, the water rippling in small frothy waves.

Having collected coolies sufficient for our small kit, we cross the river at Soo-kut ferry, and proceed down its left bank. (I found it impossible to keep up any thing of a route survey, for time is no measure of distance while travelling over such country ; the path way too was so irregular, changing its direction every few minutes.) For some distance we keep along the winding shore, passing over great sand-banks, some of which are scraped more than 60 feet to the water's edge, now following the foot track along the steep side, or clambering over the heaps of detached rock. The rocks are chiefly hard sandstone and shales, much compressed and contorted, dipping irregularly to a little west of north, at angles varying from  $30^{\circ}$  to  $90^{\circ}$ .

At the ferry, the river is running from N.  $30^{\circ}$  E and from the ferry, to about south-west for nearly half a mile. Just below that, the current is very swift and the direction of the river is about W.  $35^{\circ}$  S.; it widens in front to some 300 or more feet,\* and here there is good smooth water flowing to the south-west. Rather more than a mile below the ferry, the river is directly contacted, by rocks on the right side, to about 180 feet in breadth.

Here we cross a very picturesque and noisy cataract, a small tributary, there is another also a little further down on the opposite side. The river is now running to W.  $40^{\circ}$  S; smooth beds of hardened shales on the opposite bank dip S.  $40^{\circ}$  E. to the water's edge at angles of  $35^{\circ}$  to  $40^{\circ}$ . About two miles from the ferry another obstruction occurs in the shape of an ugly mass of white compact rock about a hundred feet long, in the bed of the river on the off side, here the stream has to make its way through a passage of about 100 feet in width, and the water descends with great velocity to some three feet lower level, but not in a drop or fall, for the channel here, though narrow, must be very deep, the water is of course much disturbed, rolling along in foaming waves.

These rocks are well covered during the floods, they look like crystalline limestone in appearance, being white and water-worn in holes. The path shortly leads away from the bank, and we mount some of the spurs, that come down from the hills to the eastward, winding through dense jungle, we descend to within a short distance of the river, where the din of rushing water is heard below, it is caused by a barrier of rock, that strikes across the bed of the river, and is dipping to the N E at angles varying from  $25^{\circ}$  to  $30^{\circ}$ . This is an immovable obstacle, for the rock consists of sedimentary beds that have been fused or semi-fused† into the hardest siliceous rock, that would defy the best steel

\* This and all subsequent estimations of the width of the river are mere guesses and not actual measurements

† The beds are curved and waved, giving unmistakable evidence that they have once been in a fused or semi-fused state

chisel nevertheless the river has forced a passage and broken its way through in three or four places the broadest is not more than 30 feet at the waters edge but is wider above, being somewhat V shaped These rocks rise high above the water, and although there would be a broad enough channel during the floods, still it must always be a very ugly and dangerous part

Some idea of the force of current may be learnt from examining these rocks although they are of the hardest kind compact, siliceous, and even vitreous, yet they have been scoured in furrows and worn in deep holes, by the trituration of well rounded pebbles of foreign rock, such as horn stone green stone porphyry &c. The surface of some of the rock has received a fine polish On either side the river huge masses and slabs lie scattered in heaps the pieces of wood seen among the rocks, are worn like pebbles of stone and mostly have fragments of gravel deeply imbedded in either end

The level of the water below the barrier appears about 18 inches, or two feet lower than above.

On the opposite side a broad bedded stream empties itself into the river just above this barrier it runs for a short distance from the south of west and I think advantage might be taken of this if the river were deemed worthy a few hundred feet up this stream, a passage might be cut to the river below the barrier and thus a side channel avoiding the barrier be opened The operation would not incur a very great cost, unless the hard rocks of the barrier strike along right through but I am inclined to think this is not the case, that there must be a fault that intercepts them otherwise the stream from the hills could not have cut so broad and deep a bed. (I should like to have crossed over, and examined the spot, to determine this point but time and circumstances would not permit )

Having regained the road, or rather pathway we turn up a contracted vale to the S E. (for there is no way along the river shore) and then ascend southward among thickly wooded hills till we arrive at a village called Maw pwh; this may be about six miles from the Soo-kti ferry and 800 feet above the bed of the river, but the hills around appear to be about 2 000 feet

Following the pathway from Maw pwh we wander among steep hills ascending and descending in a direction first south west, then more westerly, and twisting about even to N N W At about two miles from Maw pwh, we descend to within sight of the river; here it is tolerably broad say 300 feet and flowing smoothly on, between its broken rocky sides there is a foaming cataract on the opposite side the water of some hill stream falling noisily down the bank into the river

Proceeding on we lose sight of the river and pass through dense jungle again for some distance but eventually come out on to the shore of the

river where there is a small ferry but little frequented. Here the river is broader, (about 100 feet the average), occasionally widening in bay-like recesses, where there are large sand-banks sloping down to the water's edge. There are two or three small rocks rising some few feet above the surface of the water, but they are not in the main channel.

The current runs swiftly at a rather contracted part, caused by a ridge of rock projecting from the left bank, and dividing the bay-like recesses. These sandy bays would form a good place for anchorage and rendezvous: and the deep glen, intersecting the hills on the opposite side, looks a promising way into the interior of the country.

From this point, the river runs south for a distance of about three quarters of a mile, where there is a small level bit of ground, the site of an old village. A quarter of a mile further on, the river runs to S. S. E. The road does not continue along the river bank, but winds, a little distance from it, along the sides of the hills, about another mile further, we cross a stream of water running from the east, not an inconsiderable one during the floods. One mile more, and we reach the village of Bam-pân, and its small bazaar, on low ground near the river bank, and at the junction of a broad stream, that rushes impetuously, at an observable inclination, over its pebbly bed into the river.

This would be a very large stream, but for the lowness of level of the Salween, which causes a great drain on the country, nearly all the streams fall as cataracts and cascades into the river.

There is a large village, designated a town, called Nam-pa-loom, about a mile or little less up on the hills to the north-east, where the "Tsawbwah" of the district resides.

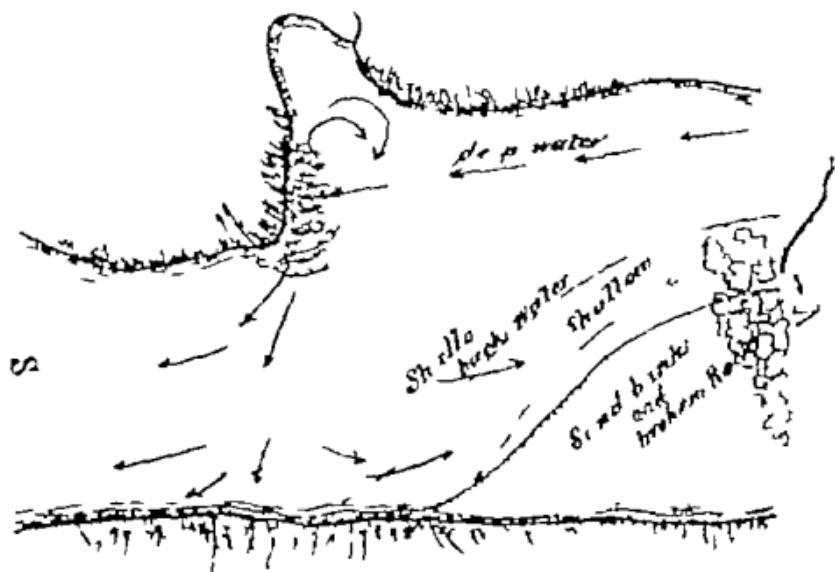
They tell us that when the water in the river is higher, they take rafts of bamboo, loaded with rice, down to one of the ferries below, a distance of two days by water, but five or six days by the road along the river bank, but at this period, the rocks appear above water, and the passages between them are too narrow, and that there are two or more falls or "cadins," beside another "barrier," this information was not altogether correct, as we shall see.

The betel-leaf vine is grown extensively on all the level patches of ground about the mouths of the streams, especially in the neighbourhood of Bam-pân, where there are very large plantations of this vine, for here the hills do not rise directly from the shores of the river.

In the river bed near Bam-pân, there is a very extensive sand-bank about 300 feet broad, and the channel is contracted to about 200 feet, a rock is seen in the middle, and another, larger, at the edge of the sand-bank, the water is flowing very swiftly, and the channel in front is narrowed to about 150 feet, by shoals of pebbles and boulders, there are also a few isolated rocks in the sand-bank, and a coarse pebble conglomerate cemented by a black arenaceous matrix of recent date.

The river is here running to the south, when about half a mile from the village, it bends to S. S. E. and S. E., then takes a rather sharp

turn to S 10 W, here at the bend the channel is not more than 200 feet there is a heap of broken rock on the north side of a small hill stream on the west bank of the river, and a high sand bank on the east side with much rock scattered near the water's edge, also the remnants (as it were) of a "kyouktan, over which the water rushes noisily and foaming About a quarter of a mile farther to southward there is a very awkward place in the river on this side is shallow water caused by a shoal of pebbles and sand that extends out some two thirds of the breadth of the stream. The deep water is on the off side close along some steeply faced rocks, where the current rushes by very swiftly, till it meets abruptly a mass of rock extending from the west bank, against which it strikes and is rejected to either side, the one on the off whirling round rejoins the coming rush, while the other sweeps diagonally across the stream a large portion running up as a backwater over the shoal above mentioned



At the face of the big rock, where there is a great foaming and loud roar, the water can be distinctly seen elevated some two feet or more above the general level of the river

A raft would have to be dragged through the shallow backwater I think a boat might be steered down the current, and be kept clear of the rock but a large vessel as a steamer, would almost inevitably come to grief. There is deep water apparently, between the projecting corner of rock on the west side of the river and the rocks below the shoal on the east bank, a distance rather less than 200 feet

The rocks are hardened shales and sandstone beds dipping to the south-west at angles of  $15^{\circ}$  or  $20^{\circ}$

Just below, the river widens in small bays on either side, but in front it is again rock-bound with steep broken sides, the water, smooth and deep, is flowing to the south-south-east.

Following the pathway, we now ascend and descend very steeply over hills and spurs, and again strike the river about a mile and a half to the southward, where there is a sharp turn in its course the river comes from the N. N. W but ultimately bends to E, then round to S S W and then goes on south. This is indeed an ugly rocky turn, but the water is flowing smoothly and slowly, and it appears to me that a skilful helmsman might steer his vessel clear, for there is room enough in the sandy bays to move about, but just above this turn there are three or four rocks, projecting many feet above water, that must be dangerous during the floods when the current runs strongly

The rock is slaty, greatly contorted, and much intersected by white quartz veins, this looks promisingly metalliferous,\* the river has cut its channel across the strike of the beds

Continuing on down the side of the river, we pass a long sandy island, here the river runs about S S E, and in front widens to about 300 feet for a short distance, but is again contracted by shoals or banks of sand, pebbles and boulders to 150 feet (but during the floods it continues about 350 feet or more), here the water is swift and turbulent, in front it again runs between rocks 150 feet apart, then just below widens out in a bay of the finest sand, (there is a slaty rock in the middle of the channel, about the size of a couple of huts) (Here there is a small village on the opposite bank) We cross a cataract falling over nearly horizontal slabs of compact argillaceous rock, and pass some high masses of blue limestone

The river again takes a sharp turn, sweeping round a sand bank supported by rock below, then a great shoal of pebbles and huge boulders roughly rounded, that have been arrested in their progress down the river by a large mountain stream from the east, that here empties itself into the river falling over the southernmost extremity of the shoal. There is a great rush of water in the contracted channel of the river.

Beyond the shoal the river is running southward, and there is a sort of rapid over a submerged "kyouk-tan," where the water is very swift and noisy

In front the river runs to S.  $30^{\circ}$  E, it has a tolerably broad and regular channel between sloping pebbly banks, but I imagine it is comparatively shallow with an inclined bed, for the water runs with great velocity almost as a rapid. About a mile from the bend, we cross another large foaming stream from the hills, and here again, on the north side of

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\* Indeed the sand of the river is washed for gold in many places farther down

the stream's mouth is a great pebbly bank which contracts the river to about 130 feet just before this the current strikes and splits upon a 'kyouk tan' from the right bank, but the main channel is not narrowed, the 'kyouk tan' being at an acute angle does not extend far into the river. On the left bank just beyond the hill stream, there are high rocks nearly vertical, dipping to W 37 N  $\angle 75$  the river is here running very turbulently to S 10 W., but a quarter of a mile farther on it has a good broad channel 250 or 300 feet across is rock bound, and sandy in parts the water flowing strongly but steadily to S 10° E.

The rocks are slaty and shaly greatly contorted and crumpled, the river beyond narrows to about 180 feet for a few yards, and then in front widens in a bay on the left bank to 450 feet here there is a small rock in the middle of the channel and in front are some vertical rocks that would be dangerous during the floods farther on the current splits upon a great slab in the middle there are also insulated big rocks near the left bank here the water is very swift (the river in these parts must be some 6 or 700 feet broad during the floods) again a short distance in front the river has cut through a great 'kyouk tan' but two little rocks remaining above water.

Now we ascend the bank and lose sight of the river for a short distance meeting it again where the channel is contracted to 200 feet or less in width, by long boulder banks on the left side, the water here is swift, in front the channel is only about 160 feet, where it has cut through shaly beds dipping irregularly to the west at high angles. Again the channel widens to about 300 feet for a short distance but narrows again in front to its normal width then there is a rocky mass that extends from the left bank nearly two-thirds across the bed of the river, contracting the present channel to about 130 feet for a short distance. The river must be very deep on the off side the current is flowing swiftly and smoothly except just below the rock mass where the water boils up, as it were, very turbulently at times but along the left side where there is strong back water it is comparatively shallow both above and below the big rock.

Here we encamped on a high sand bank on the afternoon of the third day's march from Soo-kut ferry, for we now found that it was impossible for coolies with loads to proceed any farther indeed it was most difficult for a man without any load to get along the rocks in front, and had it not been for the timely counsel and assistance of some men from the village opposite, we should have been obliged to turn back.

These men persuaded us to proceed to the Tü-caw ferry by raft down the river telling us that Tü-caw was at least 8 days' journey by land whereas a raft would reach there in about two or three days they also assured us that they and their fathers and grandfathers before them had on certain occasions taken rice in large quantities by rafts down to Tü-caw ferry and although there are four or five falls and the noted "three rocks" to pass, yet under the protection of "Nai" of the river

they had always gone safely. We therefore accepted their offer to take us down the river to Tâ-caw, and by the evening of the second day they had built and completed a capital bamboo raft 45 feet by 18 or 19, the upper floor, 14 by 12, was raised 3 feet above the lower.

On the following morning, the men having first invoked the river-“Nât” with offerings and prayer for the safety of the raft, we embarked and pushed off

I will now continue the description of the river in the form of a timed diary.

Having got well into the current on the off side, we move steadily along, gradually increasing in speed towards the  
March 31st, at 7-25 first fall a few hundred yards in front, just at a  
A.M. turn in the river from running about south, to  
nearly south-east. The banks are high and rocky, and the hills rise  
directly from them (Within twenty minutes after

At 7-43 A.M. starting) we are speeding down the rapid (or fall of  
about three feet) and into the boisterous water below, dashing along  
through great waves that bend about the raft as whalebone, severely testing  
its strength and swamping a portion of the upper floor, but every  
thing was well secured and lashed to the raft. At this fall the river is  
contracted, and the water, reflected from either side, and perhaps from  
the bottom, meets in the middle and dashes on in large foaming waves as  
of a chopping sea. We are quickly borne along and are descending the

At 7-48 A.M. second rapid, (the fall is greater and more abrupt,  
being about four feet) with great waves and roaring  
sea on below, but continuing on we soon get into smooth water  
350 feet or more broad the direction is about S 35° E

At 8-12 A.M. We descend another smaller rapid and turn  
S 25° E, we pass a hamlet on the east side, very  
At 8-16 A.M. steep hills. Our average rate of progress appears,  
at a guess, to be about six miles per hour. Now  
we are in disturbed water, a rocky irregular bottom I imagine

At 8-20 A.M. Going much slower (say 4 knots an hour), again,  
At 8-25 A.M. in front faster say five knots, going South 10° East.

At 8-35 A.M. Going South-East about four knots in an hour  
A large sandy bay on the right side, going about S 40° E passing  
At 8-39 A.M. a cataract over the right bank from a hill stream,  
At 8-46 A.M. descending a small rapid, disturbed water running  
At 8-47. A.M. swiftly between rocks 100 feet apart, there is a  
huge insulated rock just beyond near to the left  
bank, here the river is broad again

We now go along very slowly, twirling and circling round and  
about with the stream, but in front the current is  
stronger, and reflected from side to side by rocky  
parts, and boulder points jutting out from the banks into the river.

At 9-15 A. M. Passing a small fall and noisy rapid at great velocity the water just beyond is much disturbed, boiling up and reflected from side to side. After getting clear of this bad water we move along slowly to south by east for some distance; passing several cataracts on either side one of these hill streams has caused a deposit of pebbles and boulders just on the south side of its mouth here also is a big rapid with a fall of eighteen inches or so below which the current runs in a semi-circular form striking off from rock faces on the right, across to rocks on the left bank, the water foaming and irregular

In front we pass slowly down a long reach of smooth water that widens in one part to some 400 feet we pass a very small rapid or rather swift water caused by a broken rocky heap on the right side, just beyond the mouth of a small hill stream.

The river now continues narrowed and rock bound the water is turbulent, flowing to S 85 E. we are but a short distance before reaching the largest 'hat' we have to pass, a clear fall of about five feet the surface of the water has a considerable slope towards the fall down which our raft glides with increasing velocity into the chopping sea on below. The upper floor of our raft is again swamped by the foaming billows that toss us about as a walnut-shell now in a trough with hugo waves on either side now mounted on the crest of another and descending beyond we at last gain more quiet water but still speed along fast. At the fall the river was about 130 feet wide, now it contracts to less than a hundred (say 90) feet, and there are some rocks rising high up near the right bank, that must be very dangerous during the floods. The river, still rock bound winds and then goes on South 2°

At 10-54. East rather broader but still running swiftly it widens to 300 feet, water flowing smoothly, direction to S S W

The river is not more (apparently) than 85 feet broad between vertically cleft hardened beds, contorted and crumpled, and but slightly incline above the horizontal. Just beyond these rocks, the river widens again to three hundred feet going along very slowly down a long reach of smooth water towards 'the three rocks.'

The current increases in speed as we approach these noted rocks we are passing between them, descending a fall of nearly two feet. They are in fact, portions of a great kyouk tan or reef of rock across the bed of the river, similar to the barrier' above described. The right side of the river is rocky then there is a passage of about 30 feet then a small rock and another passage of 30 feet then a great long mass of rock rising high (20 or 30 feet) above the water and then the third and widest passage (some 60

feet or more) between the mass of rock and the left bank (The rocks looked hard and splintery) We took the middle 30 feet passage, and it was a close shave for our raft, indeed we did touch the rock but no great damage resulted The water here was not boisterous, but in the broader passage they say they could not steer clear of the rocks, for the current sweeps round the left bank, and is very irregular and disturbed.

From this fall the river runs to S  $20^{\circ}$  W, and our raft again goes twirling about very slowly, we pass a projecting point on the right bank, and the water flows swiftly as we approach another roaring rapid, caused by a bank of boulders and broken rock, jutting out from the left side and sloping off to a point round which the west bank sweeps, and the current, directed from the point, strikes across and dashes against the opposite bank of vertically cleft rock

At 12-11 We are passing this point, the breadth of water channel is about 120 feet, and the fall altogether about  $2\frac{1}{2}$  or 3 feet, a chopping foaming sea below, the water running very swiftly.

At 12-15 The river is again broad and smooth, flowing to S S W Here some buffaloes on a sand-bank are the first indications of agriculture that we have seen for a long time

There must be a sort of submerged "kyouk-tan" from a rocky broken mass on the right side of the river, for the water is much disturbed and the current is directed across to the high steep-faced rocks of the left bank, consisting of beds of compact calcareous clay-stone of a blue-gray colour they are nearly horizontal, and the steeply cliff faces on the river side are weathered and water-worn in a remarkable manner, like icicles up-turned, also in long vertical grooves Huge detached masses of this rock lie scattered on either bank, giving a very imposing appearance to the river

At 12-22 P M We pass a small ferry, and a village on the left called Tat-sin.

We pull up till 1-23 P M, when we continue on our course slowly (3 or 4 knots per hour) through smooth water of good breadth (300 feet or more) in a direction S by  $10-15^{\circ}$  W The rocks here appear highly calcareous, if not limestone itself

At 1-47 P M A large stream the Nâm-Khâ, by report as large as the Salween itself, but apparently not above 60 feet broad, joins the river on the left side, flowing in flush with the Salween waters, but inside the mouth of the Nâm-Khâ, the water is rushing impetuously down a gentle incline between high rocky sides. This is the first tributary of importance that we have seen Just beyond the mouth of this stream, the Salween River widens out in a circular form, but in front, where it turns to W  $5^{\circ}$  S is again rock bound and contracted to its normal width by the same compact calcareous beds nearly horizontal, and then the black and siliceous hard rocks come in again, at first parti-

ally interbedded with the limestone. We pass an ugly large but low rock of the same in the middle of the river broken rocks in masses and great slabs also lie piled about on the banks.

At 2-0 r. m. We descend a small rapid or fall of about a foot or eighteen inches, off one of these rocky points projecting from the left bank, where there is a great rush of water and much commotion strong eddies, &c. beyond; but nothing compared to that at the former falls

At 2-7 r. m. We are rounding a great rocky mass on the right side of the river the water here is "bad" boiling up and in whirl pools and eddies, (carrying down one side of the raft) with strong undercurrents

This bad water continues for some distance the river winding to the westward

At 2-12 r. m. We pass a rock island on the left, and descend a long gradual slope of much disturbed water moving along fast there are rocks about, but the river is very broad.

At 2-15 r. m. Still in this apparent slope passing a low reef of rocks towards the left bank the channel on the right side of this reef is about 90 feet wide and that on the left side not more than 30 feet.

At 2-18 r. m. We get into quiet water, but still flowing fast a large hill stream falls into the river on the right.

At 2-20 r. m. There is a rocky point, and the water of the river boils up as it were turbulently. We are now going about W S W and at 2-26 in smooth water again, moving along steadily towards the S W

At 2-37 r. m. The rocks of the river bank are here vertical, but in front are again horizontal or nearly so; these are all of the dark hard and shaly series.

At 2-45 r. m. We pass a small village on the right the view around is more open and the hills are not so high. The river from being very broad, narrows to about 270 feet and here the water is running faster and somewhat turbulently in a direction rather North of West.

At 3-55 r. m. We pass three or four low rocks in the river there is a good breadth of water but just in front, a 'kyoul tan from the left bank contracts the channel to about two hundred feet or rather more

At 3- r. m. Going down a gradual continuous rapid swift disturbed water, chopped and broken but not rough

At 3-10 r. m. A hill stream on the right has cut its bed to the river level

At 3 15 P M River open, broad, smooth water flowing gently on (at 3 or 4 knots) low sloping hills on either side  
 Accelerating, swift, surface water slightly disturbed, we pass another village "Mine-toom", here the river is  
 At 3 25 P M. not so wide (say 220 feet) between high banks of thinly bedded rocks nearly horizontal.

At 3 30 P M Direction of river a little to the east of south  
 The river is now smoothly flowing to the S. S E., a broad regular channel, we pass an extremely picturesque cascade, foaming like snow down the high bank, and encrusting the rocks over which it falls, with a thick deposit from its calcareous water.

We pass another cataract on the left, but this stream has cut a deep and narrow gorge through the rocks, the river is now running to South 30° East. and at 4-10 to  
 At 4-0'c P M S. S E again very broad We pull up at a sand bank, near a village, and make fast for the night Shut among hills as this river is, the days close in early, for the sun is only visible from about 8 A M. in the morning to 4 o'clock in the afternoon or soon after. We have come, I imagine, a distance of about 25 or 30 miles to-day.

April 1st We start at 6-5 A. M and proceed on smoothly but not very slowly  
 At 6-40 A. M A high mass of rock in the river on the right  
 A long reach of smooth water flowing gently, direction about S 35° E., channel broad small streams from the hills, occasionally contribute their waters falling in cataracts down the banks of the river  
 After 7-0'c. A. M The river runs about S S E, or rather more southerly, all smooth water, going about four knots an hour. It turns to S 30° E, at this bend, the river is very wide about 600 feet, here there is a village on the right side Again a sharp bend in the river, and just before this we passed some rocks, first a small one, then, a couple of hundred yards in front, a huge insulated rock, consisting of the dark beds below, supporting the limestone but the river is wide and the passages on either side broad enough.  
 At 7-20 A M A large stream flows in on the left bank near the village of Ho-yaw, going S S E

At 7-44 A M A low shoal of pebbles extending from the right bank, causes the current to be directed off from it to the opposite rocky side, where the water is disturbed and flowing swiftly, there were a few natives occupied in washing for gold among the sand and pebbles of the shore After rounding this shoal there is a long reach of fast flowing water to S 20° E

Direction more easterly nearly south-east. Again E. 20 S still At 8-25 A. M. smooth water and now going very slowly for the At 8-50 A. M. river is broad and the channel regular about 400 feet across very high hills are seen in front, a long way off to eastward

At 9-50 A. M. We have been moving along very slowly the direction now is to S 30 E

We pass a long high rock with vertical sides and smooth faces,

At 10-00 A. M. apparently an island, on the left side of the river the channel between it and the right bank is not much more than 250 feet. From this the river runs S 40 E we pass another foaming cataract on the left side, and a hamlet on the hills to the right.

At 10-33 A large rock on the left, river broad.

We have passed several villages and crossings, the river is still very broad (about 400 feet), its direction S 20 E  
By 12 o c., (noon).

At 12 7 The water is disturbed in places, as though there were rock below

Going south. The river widens out in a basin shaped form nearly

At 12 10 300 yards across partially enclosed in front by a low shoal or bank of pebbles and broken rock that

At 12 15 extends for a distance of 300 feet from the main bank on the right here the channel is not more than 300 feet wide, and the water is running swiftly

We pass a large village called Ban pain, on the right bank where there are some cocoanut trees. The water again

At 12 25 runs swiftly and disturbed as we near another large shoal that deflects and contracts the channel for a short distance

At 12-35 A large and impetuous hill stream discharges itself at the right bank a prominent conical hill is seen to westward

Several boats were observed about here and there are villages on either bank the country is apparently more open

At 12-40 and cultivated no high hills being visible in the vicinity of the river

Another large stream falls into the river on the right side dividing into three very picturesque cataracts down the rocky bank. The river turns S.E., flowing very slowly

At 12 47 Passing a high rock with a small pagoda on its summit. This big rock insulated during the floods, is now connected with the right bank by a sandy shoal that extends

some distance below the rock

Direction more easterly nearly, south-east. Again E 20 S still  
 At 8-25 A. M. smooth water, and now going very slowly for the  
 At 8-50 A. M. river is broad and the channel regular about 400  
 feet across, very high hills are seen in front a long  
 way off to eastward.

At 9-30 A. M. We have been moving along very slowly, the  
 direction now is to S 30 E

We pass a long high rock with vertical sides and smooth faces,

At 10-00 A. M. apparently an island, on the left side of the river  
 the channel between it and the right bank is not  
 much more than 250 feet. From this the river runs S 40 E, we pass  
 another foaming cataract on the left side, and a hamlet on the hills to  
 the right

At 10-33 A large rock on the left river broad.

We have passed several villages and crossings, the river is still  
 By 12 o.c. (noon). very broad (about 400 feet), its direction S  
 20 E.

At 12-7 The water is disturbed in places, as though  
 there were rock below

Going south. The river widens out in a basin shaped form nearly

At 12-10 300 yards across partially enclosed in front by a  
 low shoal or bank of pebbles and broken rock that

At 12-12 extends for a distance of 300 feet from the main  
 bank on the right here the channel is not more than 300 feet wide, and  
 the water is running swiftly

We pass a large village called Ban pam on the right bank where  
 there are some cocoanut trees. The water again

At 12-28 runs swiftly and disturbed as we near another large  
 shoal that deflects and contracts the channel for a short distance.

At 12-35 A large and impetuous hill stream discharges  
 itself at the right bank a prominent conical hill  
 is seen to westward.

Several boats were observed about here, and there are villages on  
 either bank the country is apparently more open

At 12-40. and cultivated no high hills being visible in the  
 vicinity of the river

Another large stream falls into the river on the right side divid-  
 ing into three very picturesque cataracts down the  
 At 1-7 rocky bank. The river turns S.E., flowing very  
 slowly

Passing a high rock with a small pagoda on its summit. This big  
 rock insulated during the floods, is now connected

At 1-13 with the right bank by a sandy shoal that extends  
 some distance below the rock

At 1-30 Fine broad river flowing to S.  $30^{\circ}$  E, at about two or three knots per hour.

At 1-40 There is a long sand-bank on the right, and a village, Bam-boom, with cocoanut and other palms, beyond this, the river takes a very broad sweep round to the south

We are approaching a small rapid, the river being very broad the fall is scarcely perceptible; though the water, just At 2 o'clock P M beyond a line across the surface, is disturbed and running swiftly, specially on the left side, where it roars over some low rocks that form part of a conglomerate bed, of quartz and other pebbles with dark matrix, lying horizontally in the sandy shore. There is a small village up on the bank. The bearing of the river is again to S S E, its average width nearly five hundred feet

We are going along faster, and the water is strong and turbulent as At 2-10 we round a big mass of calcareous rocks on the right side after passing this, the water is smooth and broad again

We have passed two or three villages, the last a large place, below At 2-50. which there were a number of gold washers on the pebble bank, that extends out from the right side of the river, causing a sort of rapid

At 2-55 The water is again much disturbed near the right bank. After 3 o'clock we move along At 3-8 very slowly, and the direction is southerly.

We enter a bend in the river, the channel sweeping round a very At 3-15 extensive deposit of boulders, pebbles and sand on the left bank, at the mouth of a large stream that has partially cleared its way through this deposit, and dashing over the boulders, rushes impetuously and with much noise, down to the river. At this point, the water of the river is very turbulent, and the current running swiftly. Having passed this great bend we shortly arrive at the Tà-caw ferry, where the river, though very broad (between 4 and 5 hundred feet), is flowing on still very swiftly to the southward.

There are high and almost precipitous hills to the east, intersected by a great gap or contracted valley, through which the large stream above mentioned is said to run. A long stragling village is situated on the left bank of the river, and a small one up on the west side.

The river here must be at least 700 or 800 feet wide during the floods, that rise to about 40 or 50 feet above the present level.

On the morning after our arrival at the Tà-caw ferry, I observed that the river had risen two feet or more during the night, and the velocity of the current appeared greatly increased, \* and by 8 o'clock P M of

\* Logs, rubbish, and old rafts, hitherto lodged among the rocks, came shooting down at great speed

the same day (2nd April), it had risen in all about 4 feet but this, we were told, was not the commencement of the great floods that occur in July and August.

The difference of level between the Soo-kat and the Ta-caw ferry is about 140 feet, the latter being about 800 or 900 feet above the level of the sea.\*

It was reported that there are five falls in the river between Ta-caw and the Keun-taung and Keun-khan-gyeo ferries † about the latitude of Moné. The first of these falls is met about half a day's journey below Ta-caw, (where the river is said to be contracted to within a stone's throw across) It is a fall of several feet so deep indeed that no one has ventured down it but we were informed that raftsmen, when taking loads occasionally to Na-loon or Tee-hmune on the river below had unloaded above the fall and weighting their raft with rock, had let it go then, catching it again below had reloaded having carried their goods round by land.

From the above description of the river, it will be evident that the Salween is not a navigable river for either boats or steamers at this season of the year and that when the river is full and the surface of its waters even, the velocity of the current must be so great in parts, that no ordinary steamer could be propelled up it.

Having relinquished the idea of making any further progress down the river, we left Ta-caw on the morning of the 3rd of April, and reached Le-deah on the 8th idem, by a road already described from Le-deah we retraced our steps to Te-thone and Pway hla, the latter a large village, a short distance to the north west of Kyauk-tat.

Leaving Pway hla we proceed westward by the high road that leads out of the Shan state and down to the town of Hhne-det,‡ distant about four days journey from Pway hla.

This road is said to be the best and is the one by which the Burmese march their troops into the interior of the Shan states. In the first march from Pway hla, we pass through open country or up-lands in a direction south of west for about seven miles; then among jungle and hilly ground, there is a narrow rocky little pass or defile to get through (very difficult for loaded bullocks or elephants) and then a good broad road gradually descending to the north west here the country is thickly wooded, except near several small hill villages where there are clearings and much cultivation, for the ground is humid and the soil good. The road passes over one or two antechinials or spurs and then zig-zags down a

\* According to the Aneroids; the Boiling point Thermometer makes it rather less.

† There are four Kedas, namely Keila-tin, Keila-taung, Keila-kha, and Keila-yong, situated to the East of the Salween, but is impossible to determine their positions from mere descriptions or report of the natives. Keila-yong is said to be the largest of these towns, and was formerly noted for its gold mines and a large trade in silk &c but considering how very much these towns have declined of late years, it is very probable that the Chinese have pretty well exhausted the mineral resources.

‡ Or Llein-dha as it is sometimes written

steep and stony descent, to the Lé-byin or Tsim-goo tsakahn, near a village of the same name, situated in a small but fertile vale with a fine stream of water flowing to the north-west

Leaving Tsim-goo, we cross the stream, and ascend by a rough and rocky road to the top of a watershed, that rises to the south in a high ridge with precipitous cliffs to the westward

But where the road crosses there is a spur leading off, down which we follow, descending very steeply over stony debris, for a long way, reaching a dry rocky stream course, we follow it down for some distance farther, where it is joined by another from the south-east. On the descent we passed much calcareous tufa, or rather travertin, near a small spring, where it occurs in shelves and thickly encrusting the rocks. All this ground is acid and stony. Some non-wood and a few small teak trees were observed among the scrub jungle. The stream bed is now broad and less inclined, but still among hills, the rocks are of grey sandstone and grits, dipping at high inclinations to the north-east, there are also masses of a large pebble conglomerate of a reddish color. A short way on, this dry stream course meets the Ké-gouk Khyoung with much water flowing from the south. Crossing and recrossing this stream many times, we soon arrive at its mouth, where it joins a very broad rivulet called the "Myit". We now proceed *up* the "Myit", in its bed, which being flat, sandy, and very broad, has little depth of water at this season of the year.

Our direction is on the average westward, with steep and almost precipitous hills thickly wooded on either side, and farther up, where the bed of the "Myit" becomes irregular and rocky, with boulders well scored and polished, there is a cliff of blue limestone some 600 feet high, rising directly from the left side of the stream. On the same side there is a hot spring, issuing at a temperature of about 100° Fht, from white crystalline limestone. A short way above this, the "Myit" has taken a sharp bend, running from the south, round to the east. At this point we leave the large stream and continue on westward, ascending the bed of a small nullah, and pass over a slight anticlinal on to open undulating ground, and, turning south-west, and then south by west, we again reach the big stream near the village of Koo-gyee, situated on its west bank here level and open. The high hills, now on the east side only, terminate in great cliffs running north and south.

This "Myit" is said to join the Myid-ngé, it must have its rise somewhere near the "Tsim-toun-gyee" hill, and is—I am inclined to think—the same as the people of Ye-me-then term the Pan-loung Khyoung. It is remarkable, that after running to the north along the west side of high cliffs, it should turn eastward by a narrow pass or gap through them, for the country to the westward is comparatively open, rising in gentle undulations to no great height, the watershed that is crossed in going from Koo-gyee to Hline-det being not more than 400 feet above the former place, but about 700 feet above the latter.

There are two roads from Koo-gyee to Hlne-det-myo, the one by which I went, supposed to be the shortest, was a distance of about 20 miles, and no water was found the whole way this scarcity of water and the excessive heat of the season had proved fatal to many a bullock while on the march, whose carcasses were still lying on the road.

The first part of this road follows up a broad sandy torrent bed that drains towards the 'Myit,' and then passes over undulating ground of gravels and sands much intersected by stream courses. In many of these broad stream courses some novel looking rocks were seen a kind of trap or greenstone porphyry projecting through the sandy bed and also a softish rock, light colored and speckled green and white. The rising ground distant about 8 miles from Koo-gyee, and forming the watershed above mentioned, also consists of similar crystalline rocks all these are metamorphosed sedimentary beds they disintegrate rapidly on the surface, from whence the sand of the streams is in a great measure derived.

After passing this watershed blue clays and shales occur much crumpled also dark shaly and slaty beds dipping at high inclinations to the S.W and S S W but in front the crystalline and siliceous speckled rocks—so much like decomposing granite—again make their appearance in another rise or anticinal and then beyond, the hard shales and slaty beds again dipping to the S S W The whole of this tract of country is stony arid and barren for there is little or no soil. When about sixteen miles from Koo-gyee the road descends a steep and rocky scarp on to low ground with a gradual slope to the flat alluvial plain beyond that now stretches out before the unbounded view.

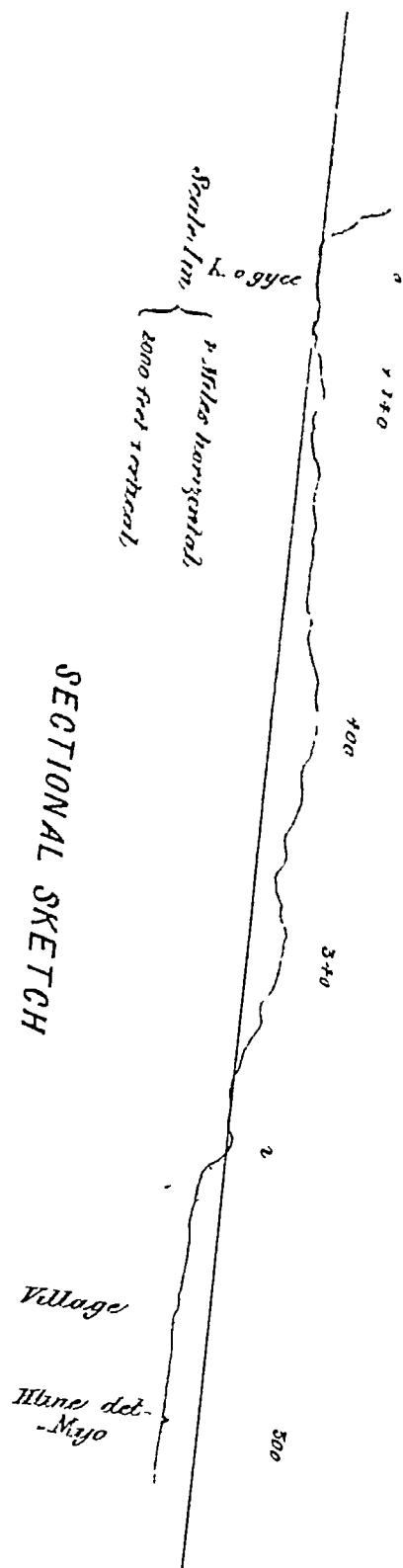
The sectional sketch below may serve to show the difference of level, between the valley of the 'Myit' at Koo-gyee and the plain at Hlne-det, and the intervening watershed.

The Aneroid readings at the principal stations on this road\* out of the Shan States were as follow —

April 18th Pway hla	at 4-45 a.m.	Barom (D) 29 031	Therm. 61 7
," 19th, Taungoo Tsakahn	4	," 27 362	69 7
," 20th Koog yee	4	," 28 550	72 7
," On the march	8-30	," 28 164	80
," 21st Hlne-det	12 (noon)	," 29 030	103*

The three descents be it observed diminish in depth towards the plain thus Taungoo is about 16 hundred feet below the level of Pway hla, Koo-gyee 11 hundred feet lower than Taungoo, and Hlne-det 3 hundred feet lower than Koo-gyee making a total of three thousand feet difference of level, between Pway hla and the plain of Hlne-det. The elevation of this plain is according to the Aneroids about eight hundred feet above the level of the sea but the boiling point Therm-

The road leaving the Shan States by the Nat : lk pass is further to the south, and is said to be one long and continuous descent to the plain of the Irawaddie



*Ruoppa Town from the North East, distant 15 to 20 Miles*

meter makes it only 550 feet, and thus, I think, must be considered the more correct altitude

Hlme-det-myo lies to the south of Pen-the-le and about 30 miles north of Yé-mé-then it is five or six days' journey from the Irawadee; the road down to the river, passes in a north-west direction to the town of Myin-gyan\* about 16 miles north of Pagan. The first part of this road is across the flat alluvial plain, the Sam-mong Khyoung is met about two miles from the town, (Hlme-det,) it is a shallow bedded stream and dry during the hot season, it drains from the south, and is said to join the "Myit" or Pan-loung. When about ten miles from Hlme-det, the road passes over a very slight rise of sandy ground, and eight miles further, it leaves the plain and proceeds on through a gently undulating tract of country, of sand, gravels, and the outcrops of thinly bedded rock at low angles of inclination, and a soft or incoherent sand-stone with large nodular conccretions fossil wood also occurs sparingly in a more recent deposit. After passing the watershed, a low anticlinal in this ground, an extensive view is obtained to the westward, and the lofty hill of Paoppa now makes its appearance a long way off to the west-south-west, many large villages and towns are seen, and the road on the descent towards the river passes through several, all of which are well fenced round, and the compounds and roads hedged in with cut thorn-bushes and bryars. Within the large villages, there is generally an open space or barton for bazaar carts, &c

When about north-east of Paoppa-toung, a better view is obtained of this extinct volcano, an outline of which is given below, its height, as estimated by Mr Blanford, who ascended it in 1861, is about 3,000 feet from base to summit, the highest peak being nearly 5,000 feet above the level of the sea

Before concluding this report, I would briefly remark, that a botanist would find great interest and, doubtless, many novelties in the flora of the Shan country. It comprises both tropical and temperate forms, and I believe he might make a long list of wild flowers there in common with those of England. I recognized among others, the Violet, Buttercup, Forget-me-not, Jasmine, &c, the Strawberry, and a large *Arum maculatum*. A yellow Raspberry is very common, the plant of which is not unlike the Blackberry bush, and a small tree without thorns but resembling the May in every other respect.

There is no lack of small game in the Shan States, Water-fowl abound on the tanks and jheels, Partridges and Pea-fowl are also very common, Pheasants not so, and the Jungle-fowl is quite a rare bird, but Pigeons of many kinds are plentiful in large flocks. The Cuckoo, though not a game bird, must not be forgotten, it visits the country about March and remains until the rainy season comes on.

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\* Or "Myeen-kyan as it is written on Hule's map

Hares are numerous on the grassy downs and plains, and a few small deer were seen. Large game is rare, there are however wild Elephants among the hills crossed before reaching La-shoo. The Tiger also is to be found occasionally in the more jungly parts of the low country

FRANCIS FEDDEN,

*Ass't, Geological Survey of India*

*and Scientific Officer of the*

*Late Salween Expedition*

RANGOON

*4th August 1860*

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## **METEOROLOGICAL OBSERVATIONS.**

## PREFATORY REMARKS

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Thermometer (N) by W. Newman and Co. Calcutta,—a good weather instrument taken as the standard in the tables.

Thermometer (F) by J. F. Newman, London,—a small and very poor one mounted on porcelain imperfectly graduated and so irregular that it was discarded after the 9th January 1866.

Aneroid Barometer (D) by Dent, Paris,—a serviceable instrument but its capacity is not known; and its Thermometer (d.) being detached and of spirit, can not indicate the temperature of the instrument and is much too sensitive. On the 1st of February Thermometer (N.) stood at  $42^{\circ}$  and (c.) at  $41^{\circ}$  while (d.) read  $54^{\circ}$ ; it had evidently gone wrong, for a dry deposit in the tube at  $82^{\circ}$  showed a decomposition of a portion of the liquid.

Aneroid Barometer (C) by C. Nephew and Co. Calcutta,—a sensitive instrument, but (unfortunately for measuring heights) it is graduated only half way round the dial. Its Thermometer (c.) is mercurial and inserted in the Aneroid.

The time at each observation was noted, but for the convenience of tabulation, they have been arranged under the three heads, "EARLY MORNING (before sun rise); "NOON" (or Afternoon) and "EVENING" (three or four hours after sun set). And in the tables, the exact time has been registered only when it happens to be beyond the scope of that noted in the heading of the column.

F F

November and December 1864

No.	Date	EARLY MORNING, 4, 30 OR 5 O'CLOCK A.M.			NOON OR AFTER-NOON			EVENING 9-30 OR 10 P.M.			STATION AND REMARKS		
		Therm	Alt. Therm	Alt. Barom	Therm	Alt. Therm	Alt. Barom	Therm	Alt. Therm	Alt. Barom	Therm	Alt. Therm	Alt. Barom
Nov. 12th					82°	80°		29 940					
" 30th					76°			29 763					
Dec. 8th					80°			29 642					
" 9th													
" 10th													
" 11th													
" 12th													
" 13th													
" 14th													
" 15th	5-30	62°			29 472								
" 16th	5 45	60°			29 423								
" 17th	54°	52° 8			29 380								
" 18th	56°	55° 3			29 845								
" 19th	54°	53°			29 287	80°		29 255					
" 20th	57°	55° 5			29 218	76° 5	78°	29 230					
" 21st	8 a.m.	63°			29 263			29 257					
" 22nd	6 30	59°			29 289	76°		27 33					
" 23rd	6 15	61°			29 270			D					
" 24th	6 45	59° 5	59°		29 360	78°		C					
"	7-30	61°	59° 3		29 406	75°	76° 8	29 335	29 380	68°	66°	29 281	29 330
"	9 a.m.	66° 7	66° 7		D	C							
" 26th	7-30	61°	60°		29 35	29 410		67°					
" 27th	6-30	56°	55° 4		29 265	29 330		67°					
" 28th	6-30	55°	54°		29 222	29 300	75°	29 279	29 328	7-30	63° 8	29 220	29 280
" 29th	6-45	64° 2	64° 2		29 25	29 320		71°					
" 30th	4-15 †	64° 2	64° 2		29 318			61°					
" 31st	57°	56°			28 666	70°		71° 8	27 433	27 478	8-30	54°	27 44
† at 5 a.m.		69°	58°										

At Nyn-gyun Myo

Ditto ditto

Ditto ditto and at Keedoungkan Tsakahn  
Keedoungkan and Shway-Myo Tsakahn

Shway Myo Tsakahn and Gyo-ben-long  
Gyo-ben Kong

Ditto ditto and Nai-oung-kan

Nai oung-kan and Ye-me-then Myo

Ye me then Myo

Ditto ditto

¶

Off Monkey Point (level of river at half flood)

Rangoon  
At Toungoo Station

At Myo-lha village, 30 miles north of Toungoo

and 5 from frontier

the hills ditto ditto

(Barometer rising)

January 1865

LITERATURE

DCC



February 1865

EARLY MORNING 4:30 OR 5 O'C. A. M.

NOON OR AFTERNOON								EVENING GENERALLY 9 8:30 OR 10 P. M.						
Therm.	Att.	Anem.	Therm.	Att.	Anem.	Therm.	Att.	Anem.	Therm.	Att.	Anem.			
Therm.	Therm.	Therm.	Therm.	Therm.	Therm.	Therm.	Therm.	Therm.	Therm.	Therm.	Therm.			
Feb 1st	N 42° 40.2°	D 160.15 25.880	C 88°	N 43°	D 46.40	C 85°	N 45°	D 46.40	C 85°	N 45°	D 46.40			
2nd	— 45° 47°.3	20.150 20.200	—	—	—	—	—	—	—	—	—			
3rd	— 45° 47°.3	16.110 18.130	81°.6 (2 x M.)	—	—	—	—	—	—	—	—			
4th	48° 47°	28.470 28.472	0°.5	50°	53°.6	26.540 26.488	51°.8	51°.8	26.520 26.485	51°.8	51°.8			
5th	74.5 48°.2	40.2.6	86 66 26 100 71°. (2 x M.)	63.5	65°.3	16.288 16.182	64.4	64.7	18.248 18.180	64.4	64.7			
6th	40° 41°.7	26.100 20.032	—	—	—	—	—	—	—	—	—			
7th	41.5 42°	26.515 26.403	—	40°.6	43°.6	26.588 26.540	Ditto ditto, and Camp at N. K. mong (the camp at long camp) on at 6 O'clock A. M. Camp at N. K. mong (at 1 O'clock Therm. 10°) cool breeze, though sunny; front on ground early this morning.	Ditto ditto, and Kew hoan (the camp at N. K. mong was well sheltered, temperature out in the open was very much lower) Kew hoan, and Ho kin (morning very cold.) At Han-tin pleasant breeze sunny but not hot.	40°.6	43°.6	26.588 26.540	Ditto ditto, and Kew hoan (the camp at N. K. mong was well sheltered, temperature out in the open was very much lower) Kew hoan, and Ho kin (morning very cold.) At Han-tin pleasant breeze sunny but not hot.	40°.6	43°.6
8th	45°.5 48.7	26.511 26.512 74	—	44°	49°	26.497 26.458	45°.5	49°	26.497 26.458	45°.5	49°			
9th	42° 41.5	30.025 30.025	—	—	—	—	—	—	—	—	—			
10th	43°.2 43.7	27.010 27.010	86 —	47.2	49.8	20.700 20.653	44.2	47.3	27.048 27.53	44.2	47.3			
				53.5	53.5	27.046 27.036	Kain koon (instrument on our side wall) tent, at noon great reflection from paddy ground.)	53.5	53.5	27.046 27.036	Kain koon (instrument on our side wall) tent, at noon great reflection from paddy ground.)	53.5		

STATION AND REMARKS

Feb 11th	..	48°	47°	27 000	27 026	.	.	.	63°	64°	27 110	27 150	Kan-loon, and Camp at Mine-tha cloudball day close, at even boisterous wind, at 9 P.M. clear sky	
12th	7 O'c	56° 7	56° 7	27 102	27 154	77°	(3-30)	..	57° 3	58°	27 090	27 132	Camp at Mine-tha	
13th	.	51°	49° 6	27 030	27 080	.	.	.	65° 2	66° 2	27 058	27 078	Ditto ditto, and on bank of Nam-má-li, day fine pleasant, much cloud fleeting, mild evening	
14th	..	47° 9	46° 8	27 020	27 046	..	.	.	52° 2	52° 6	26 816	26 819	Camp on bank of Nam-má-li, and Oot-too much cooler this evening	
15th	..	41° 3	40°	26 780	26 795	.	.	.	54° 3	54° 2	27 233	27 290	Oot-too, and Camp in large Kyoung compound, 8 miles north of Oot-too (morning very cold)	
16th	47° 7	46° 5	27 210	27 270	.	.	.	54° 7	56° 5	27 790	27 935	Camp at Kyoung compound, and Keo-shang-nang, (the lowest station since leaving Poungloung Tsu Jan 4th)		
17th	..	44°	43° 5	27 757	27 919	70° 8	71° 9	..	52°	51°	27 005	27 047	Keo shang-nang, and Ho-loi, ("Toung-tate") (morning cold and raw, fog came on late.) Therm max 74°	
18th	..	49° 8	48°	26 989	17 045	77° 5	(3 30)	80°	27 217	27 264	55°	55°	27 204 27 266 (Ho-loi or Toung-tate, and Lá-sheeo (very cold morn, but sun was on instruments when I had risen), day fine	
19th	.	.	.	.	.	70°	71°	..	54°	54°	27 229	27 298	Lá-sheeo (Barometer falling)	
20th	6 45	46°	45°	27 225	27 314	76°	77°	27 270	27 345	59°	59° 2	27 259	27 328	Ditto (Barometer falling)
21st	6 O'c	45°	43°	27 217	27 298	.	.	.	57° 8	58° 7	27 200	27 266	Ditto (day cloudy, at noon sky overcast, and at sun set a little rain fell.)	
22nd	.	45°	45° 3	27 143	27 219	.	.	.	61°	62°	27 223	27 297	Do and Mine-tin East of La-sheeo, Mine-yin and Mine-yaw Myo (Mine-yin camp was sheltered beneath a Banyan grove, much colder out in the open)	
23rd	49°	49°	48°	27 180	27 265	.	.	.	57°	58°	27 237	27 292	Mine-tin, and Mine-yin Myo	
24th	.	49°	48°	27 193	27 258	.	.	.	61°	61°	27 090	27 130	Mine-yaw town (Barom falling) South east of Thine-my o, in Lat 23° N	
7-30	51° 3	48°	27 079	27 135	76°	77°	27 110	27 150	61° 5	61° 5	27 056	27 090	Ditto (At noon on "Loi-Sat," no good shade), most northerly point reached	
26th	6	49° 5	48°	27 000	27 056	.	.	.	63°	63°	27 028	27 049	Ditto (On return march to Lá-sheeo)	
27th	...	50° 6	49° 8	27 023	27 065	75°	78°	25 43	.	.	.	.	.	
28th	...	...	...	...	...	.	.	.	60°	61° 3	27 264	27 340	Neoum-mo	

March 1865

SALT Monitors 4-30 on 5 A. M.



April 1885

Early Morn 4:30 or 5:00 A. M.

Evening generally 9-10 or 10 P.M.

SOLUTIONS AND REMARKS

EARLY MORNING 4-30 OR 5 O'C. A. M.				EVENING GENERALLY 9 9-30 OR 10 P. M.			
	Therm.	All. Therm.	Aneroid.		Therm.	All. Therm.	Aneroid.
April 1st				0-30	0	D.	C.
	...	...	...	10-30	66	28-700	20-000
	...	...	...	8-9 P. M.	64°	28-605	20-076
2nd	8 A. M.	64-0	28-607	99-100	71°	28-705	29-000
3rd	8-45	68-7	29-830	20-118	...	...	...
4th	10-30	80	20-647	20-671	...	...	...
5th	64	63° 8	27-905	28-182	...	...	...
6th	61	61-7	27-07	27-126	...	...	...
7th	71	...	...	...	...	...	...
8th	71	...	...	...	...	...	...
9th	71	...	...	...	...	...	...
10th	71	...	...	...	10-20	81-5	26-670
11th	72	02	" 025	8-607	8-20	10-014	10-014
					72	46-005	26-010
							near Ban Chan; cloudy thunder in the distance

April 1866

Four Miles 4-30 and 5 Oc. A.M.

BREVINGUORIBALLY 9  
9-30 or 10 P.M.

STATIONS AND REMARKS.

				BREVINGUORIBALLY 9 9-30 or 10 P.M.			BREVINGUORIBALLY 9 9-30 or 10 P.M.		
		Therm.	Alt. Therm.			Therm.	Alt. Therm.		
April	1st			D.	C.			D.	C.
ad	8 A.M.	...	...	...	...	9-30	0	0	0
		64	6	93	697	99-100	65°	28-799	20-060
						10-30	64°	28-805	20-076
						8-7 P.M.	70°	28-153	29-00
2nd	3-15	58°7	29	836	20	116	...	...	...
4th	10-30	80	26	747	26	677	...	...	...
5th	63°9	57	29	793	29	182	...	...	...
6th	61	7	27	77	27	126	...	...	...
7th		...	...	...	...	...	...	...	...
8th		...	...	...	...	...	...	...	...
9th		...	...	...	...	...	...	...	...
10th		...	...	...	...	...	...	...	...
11th		...	...	...	...	...	...	...	...
12th		63°	26	026	26	5-30	10	30	8-20
						81	5	98	676
						72°5	...	20	044
							April	Therm.	103
							La-deh,	and Camp	near Ban-chain; cloudy thunder in the distance.

\* On the March crossing hills to Nattit on a lower true shade, and it retains the heat long after sun-down.

Therm 10°, sulky and hot. Early morn cool and fresh, Hlne det 10°, 5°, breezes now and then sky misty and cloudy hot to-day, rain fell at 4 p.m., whole continued falling gently during the evening

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F. FEDDEN,  
*Geol. Survey of India.*



# APPENDIX.

The following are some of the calculations for Latitude, worked out in detail, from meridian observations taken at the several halting places on the route. The system of working is mainly that of Raper.

1864 November 30th—Tounghoo Cantonment.

Thermometer  $76^{\circ}$  Fht. . . . . *Longitude about  $96^{\circ} 30' E.$*   
Barometer 20.763 Inches

	<i>Raper.</i>			
Mean Refrac. at 50=50 <sup>0</sup> .6 (T. <sup>31</sup> )		Obs. Alt. $\odot$	$98^{\circ} 13' 50''$	
Therm corr. — 2 <sup>0</sup> .6 (T. <sup>32</sup> )		Index error	— 1' 30''	
Barom. corr. — 0 <sup>0</sup> .4 (T. <sup>33</sup> )			<u>2) 98° 12' 20''</u>	
Px. in Alt 50° = — 5 <sup>0</sup> 6	47 <sup>0</sup> 6	Appx. Alt $\odot$	... 49° 6' 10''	
Corr. of Alt . . . . .	42 <sup>0</sup> 0	Corr. of Alt	— 0 0 42''	
	<u>—</u>	True Alt. $\odot$	<u>49° 5' 28''</u>	
E. Long. $96^{\circ} 30' =$	$\frac{h \text{ m.}}{6 \text{ 26}}$	Sun's semi-diam.	+ 16' 15'' 7	
	— 24	True Alt. $\odot$	<u>49° 21' 43'' 7</u>	
G. Date Nov. 29th 17 34 (appt. time)		Zenith dist.	. 40° 38' 16'' 3 N	
		Red. decl	... 21° 42' 24'' 0 S	
		<i>True Latitude</i>	<u>18° 55' 52'' 3 N.</u>	

Sun's decl. 29th .. S  $21^{\circ} 35' 17'' 1$   
30th . . . . . S.  $21^{\circ} 45' 0'' 9$  (incig) *Norie*

Daily var. (24 h)  $0^{\circ} 9' 43'' 8$ =Log. 3925 (Txxxiii)

G. D. Nov. 29th 17 34=Log 1355 (,,)

<i>h m.</i>	Log 5280 =	7' 6'' 9
Or G. D. 17 34 var 9' 43'' 8		
17 30 , , 9' 30'' = 6' 55'' 6	Sun's decl 29th	$21^{\circ} 35' 17'' 1$
17 30 , , 9' 43'' = 2'' 4	Red. decl.	<u>S. <math>21^{\circ} 42' 24'' 0</math></u>
17 30 , , 0 14'' = 10'' 0		
	<u>7' 7'' 0</u>	

Sun's decl 29th  $21^{\circ} 35' 17'' 1$   
Corr. for long + 7' 7''

Red. decl S.  $21^{\circ} 42' 24'' 1$

TOUNGHOO CANTONMENT—LATITUDE  $18^{\circ} 55' 52'' N$

1864 Decr 8th (noon) Mgo-ka village, near frontier

Therm	80	Fht.	Long about	96° 30' E.
Barom.	29 642	_inches.		
Mean refrac. at 47° 30' = 53° 5		Obs Alt. O	95 7 40'	
Therm. corr	— 3 8	Index error	— 1 30'	
Barom. corr	— 0° 6		2) 95 6 10'	
	49° 6			
Px. in Alt. 43	— 5 8	Corr of Alt.	47° 33' 5	
Corr of Alt.	43° 8		43° 8	
	—		47° 32' 21.2	
		Semi-diam	+ 16° 16' 0	
E. long 96° 30' = 6 26	— 24	True Alt. O	47° 45' 38' 1	
G D Dec. 7th 17 34	—	— 00		
		Zenith dist.	42 11 21 0 N	
		Red. decl.	22 45 48' 7 S	
		True Latitude	10 25 33' 2 N	

Sun's decl 7th S 22 41 13' 1  
8th S 22 47 29' 5 (uncrg)

Daily var (24 h) 6° 16' 4 = log 5820  
G D Dec. 7th 17 34 = log 1355

Or G D 17 34 var 6° 16' 4  
17 30 6 = 4 22 5  
" 10' 4 = 12 2  
" 4 6 16 = 1 075  
4 35' 775

log 7181 = + 4 35' 6  
Sun's decl. 7th 22 41 13' 1  
Red decl. S 22 45 48' 7

Sun's decl 7th 22 41 13 1  
Red. decl. S 22 45 48 775

MGO-KA VILLAGE—LATITUDE 10 25 33'

1864 December 12th (noon) Nyin-gyan town, (Camp on north bank of stream.)

Therm.  $84^{\circ}$  Barom. 29.520      *Longitude about*       $96^{\circ} 20' E.$

Mean refrac	at $47^{\circ} 20'$	$= 53'' 8$	Obs. Alt $\odot$	..	$94^{\circ} 45' 10''$
Therm corr.	—	$3'' 6$	Index error	...	$1' 30''$
Barom. corr.	—	$0'' 9$			
		$\overline{49'' 3}$			
Px. at $47^{\circ} 20'$	—	$5'' 9$			$47^{\circ} 21' 50''$
Corr. of Alt.		$43'' 4$	Corr. of Alt.		$43'' 4$
		$\overline{\overline{43'' 4}}$	True alt. $\odot$	...	$47^{\circ} 21' 6'' 6$
E. long. $96^{\circ} 20'$	$\begin{array}{c} h. \\ 6 \\ - 24 \end{array}$	$\begin{array}{c} m \\ 25 \\ \hline 34 \end{array}$	Sun's semi-diam.		$16' 17'' 3$
G Date Dec. 11th,	$\overline{17}$	$\overline{34}$	True alt. $\odot$	..	$47^{\circ} 4' 49'' 3$
		$\overline{40}$		—	$90^{\circ}$
Zenith dist.	..				$42^{\circ} 55' 10'' 7 N$
Red. decl.	..				$S. 23^{\circ} 6' 52'' 7$
True Latitude	..				$N 19^{\circ} 48' 18'' 0$

Sun's decl 11th  $S 23^{\circ} 3' 36'' 6$   
12th  $S. 23^{\circ} 8' 4'' 2$  (inerg.)

Daily var. (24 h)       $4' 27'' 6 = \log. 7310$

G D Dec 11th, 17 35 =  $\log 1351$

$\log 8661 = + 3' 16'' 0$

Sun's decl. 11th  $23^{\circ} 3' 36'' 6$

Red. decl.       $S. 23^{\circ} 6' 52'' 6$

NYIN-GYAN MYO (North Side of Town) LATITUDE  $19^{\circ} 48' 18''$

1864—December 13th (noon), Nyir gyar (Camp on north bank of stream)

Thermometer 82 Barometer 29.04      *Longitude about 00° 20' E*

Mean refrac. at 47° 10'	=	54° 0	Obs. alt. $\odot$	04° 36' 10"
Therm. corr	—	3 5	Index error	— 1 30"
Barom. corr	—	— 9		2) 04° 36' 40"
		50 6		47° 18' 20"
Px. in alt. 47	—	5 9	Corr. of alt.	.. 41 7
Corr. of alt.	—	4 7	True alt. $\odot$	47° 17' 35" 3
		4 7	Semi-diam.	— 16' 17" 4
E. long 96° 20'	=	6 25 20		47° 1 17 0
	—	24		— 90"
G Date Dec. 12th,	17 34 40			
	—		Red. decl.	N 42° 58' 42" 1
				S 23° 11' 0" 0
			True Latitude	N 19° 47' 42" 1

Sun's decl 12th      S 23° 8' 4" 2  
18th      S 23° 12' 4" 2 (incrg)

Daily var	4° 0"	= log	7781
G D 12th	17 34 40	= log	1351
		log	<u>D132</u> = + 23 6 4 2      S
		Sun's decl 12th	23 6 4 2
		Red. decl	S 23° 11' 0" 0

NYIR-GYAR NYO—LATITUDE 19° 47' 42" N

1864—December 14th (noon) Nym-gyan (North side of stream)

Therm. 81° 5 Barom. 29 56

Longitude about 96° 20' E.

Mean. refrac.	47° 10'	=	54" 1	Obs. alt. $\odot$	...	94° 31' 0"
Therm. corr.	...	—	3 5	Index error	—	1' 5"
Barom. corr.	...	—	0 9		—	
			50 7		2)	94° 29' 55"
Px. in alt. 47° 10'		—	5 9			47° 14' 57.5
Corr. of alt. ...			44" 8	Corr. of alt.	—	44" 8
			—	True alt. $\odot$	..	47° 14' 12" 7
E. long	96° 20'	=	6 25 20	Semi-diam.	—	16 17.5
		—	— 24 0 0	True alt. $\odot$	...	46 57 55.2
G D Deer 13th			17 34 40		—	90°
			—	Zenith dist.	...	43 2 4.8 N.
				Red. decl.	..	23 14 38.6
				True Latitude	N.	19° 47' 26" 2

Sun's decl. 13th 23° 12' 4" 2  
" " 14th 23° 15' 36" 5

G. D. 13th (24h.) 3' 32" 3 = log. .8320  
(17h.) 34' 40" 5 = log. .1351

log. .9671 = + 2' 34" 4

Sun's decl. 13th 23° 12' 4" 2  
2 34.4

Red. decl. 23° 14' 38" 6

NYIN-GYAN—LATITUDE 19° 47' 26" N.

1864—December 15th (noon) Camp at Kee-doung

Therm 82 Barom 29.46

Longitude about  $90^{\circ} 20' E.$ 

Mean refrac.	$46^{\circ} 30' = 55^{\circ} 34'$	Obs alt. O	93	7° 45'
Therm corr	— 3.40	Index error	—	1 5
Barom. corr	— 1.2		2) 93	6 40
	50.74		40	33 20
Pr. in alt.	— 6.14	Corr of alt.	—	44 0
Corr of alt.	44.6		46	32 35 4
	—	Sun's semi-diam.	+ 16	17 6
East long. $90^{\circ} 20'$	$= 6^{\circ} 25' 20'$	True alt. O	40	48 53 0
	— 24		—	90
G. date 14th	17 34 40	Zenith dist.	43	11 7° N
	—	Red. decl.	8	23 17' 51 8
		True Latitude	N	19 58 15° 2

Sun's decl. 14th S 23 15 36 5  
 , , 15th S 23 18 40 9 (incrg)

Daily var (244) 3 4 4 = log 8024

G. D 17 34 40 = log 1358

log 1.0277 = 2 45 3

Sun's decl. Dec. 14th S. 23° 15' 36" 5

Red. decl. S. 23 17' 51 8

CAMP AT KEE DOUNG—LATITUDE  $19^{\circ} 53' 15''$

1864—Dec. 17th (noon) Camp at Gyo-ben-long (north of Menyua)

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Therm. (about)  $80.^\circ$  Barom. 29.4Longitude about  $96^\circ 20' E$ 

Mean refrac at	$46^\circ 10' = 55'' .98$	Obs. alt. $\odot$	$92^\circ 22' 50''$
Therm corr.	35	Index error	$1' 5''$
Barom. corr.	12		
P <sub>x</sub> in alt.	$51 28$		$(2) 92 21 45$
Corr. of alt.	$6 15$		$46 10 52 5$
	$\underline{\underline{45'' 13}}$	Corr. of alt.	$45'' .13$
E long		Sun's Semi-diam	$46 10 7 37$
G. Date Decr 16th	$96^\circ 20 = 6 25 20$	True alt $\odot$	$16 17 7$
	$- 24$		$46 26 25 07$
	$\underline{\underline{17 34 40}}$	Zenith dist	$90$
		Red decl.	$N 43 33 34 93$
		True Latitude	$S 23 22 51 1$
			$N. 20^\circ 10' 43'' 83$

Sun's decl. 16th S

 $23^\circ 21' 17'' .4$   
 $23^\circ 23' 25'' .7$  (inclig)

Daily var (24 h)

 $2' 8'' .3 = \log 10510$  $17 35 = \log 1353$  $\log 11863 = 1' 33'' .7$ Sun's decl Dec. 16th  $23^\circ 21' 17.4$ Red decl.  $S 23^\circ 22' 51'' .1$ 

G. D. Dec. 16th

1864 Dec 19<sup>th</sup> (noon) *Haï-oung-gou, Isakula*Therm. 80 Fht. Barom. 29.255 *Longitude about 06° 18' E*

Mean refrac.	46°=56° 33	Obs. alt. $\odot$	91° 58' 55
Therm. corr	— 3 49	Index error	— 1 5
Barom. corr	— 1 60		<u>—</u>
	<u>51 24</u>		<u>2) 91 58' 50"</u>
Px. in alt.	— 6 14		45 58' 25
Corr of alt.	45 1	Corr of alt.	— 45° 1
	<u>—</u>		<u>—</u>
E. long	96° 18'= 6 25 15	True alt. $\odot$	46 14 57 76
	— 24		<u>— 90°</u>
G D Dec. 18th	17 34 45	Zenith dist.	43 43 2° 24' A
	<u>—</u>	Red. decl.	23 25' 55 1° S
		<i>True Latitude</i>	20° 10' 3° 70 A

Sun's decl. Dec. 18th 23 25 5 8  
,, „ „ 19th 23° 26' 17 8 (increg)

Daily var (244)	1 12"	=log	1 3010
G D 18th	17 34 45	=log	1 352
		log	1 4362 + 52 74
			<u>—</u>
		Sun's decl 18th 23 25 5 8	<u>+ 52 74</u>
			<u>—</u>
		Red. decl	<u>S. 23 25 05 08</u>

1864 Dec 19<sup>th</sup> (noon) *Nai-ong-gdn, Lelekuh*Therm. 80 Fht. Barom. 29.205 *Longitude about 96° 18' E*

Mean refrac.	46°=56° 33'	Obs. alt. O	91 59' 05"
Therm. corr	— 3 49	Index error	— 1' 3"
Barom. corr	— 1 60		<u>2) 91 58' 50"</u>
	<u>51 24</u>		45 59' 25
Px. in alt.	— 6 14	Corr. of alt.	— 45' 1
Corr. of alt.	45 1		<u>40 55' 39.0</u>
	<u>—</u>	Semi-diam	+ 10' 17.86
E. long	06° 18'= 6 25 15	True alt. O	46 14 57.76
	— 24		<u>— 90°</u>
G D Dec. 18th	17 31 45	Zenith dist.	43 13 2 21 A
	<u>—</u>	Red. decl.	23 23 55 14 S
		True Latitude	20 19' 57.70 A
			<u>—</u>

Sun's decl. Dec. 18th 23 25 5 8  
 " " 19th 23 26 17.8 (inerg)

Daily var (24)	1 12"	alog	1 3010
G D 18th	17 31 45=alog	13.2	
		log	1 14362=+ 52° 74
			<u>—</u>
			Sun's decl. 18th 23 25 5 8
			+ 52 74
			<u>—</u>
		Red. decl.	S 23 25 55.14
			<u>—</u>

1864 Dec. 20th (noon) Fé-mé-then town.

Therm 77° Barom 29.230      *Longitude about* 96° 7' 30" E.

Mean refiae	15°50'	=	56" 69	Obs alt $\odot$	. 91° 44' 56
Therm corr	...	—	3 20	Index error	— 1 5
Barom corr.	...	—	1 13		2) 91 43 51
			52 06		45 51 55 5
Px in alt	—		6 16	Corr. of alt.	— 45 9
Corr. of alt	...		45 90		45 51 9 6
				Semi-diam	+ 16 17 9
				True alt $\odot$	.. 46 7 27 5
E long 96 730	$\frac{h}{=}$	$\frac{m}{24}$	$\frac{s}{30}$	Zenith dist.	. 43 52 32 5 N
				Red. decl	. 23 26 49 77 S
G Date Dec 19th	$\frac{17}{=}$	$\frac{35}{}$	$\frac{30}{}$	True Latitude	... 20° 25' 42" 83 N.

O's decl. 19th	...	23° 26' 17" 8	
" " 20th		23 27 15	(inerg)

G. D Dec 19th		43 7	= log 15199
		17 35 30	= log 1349
			log 16548 = + 31" 97

Sun's decl. 19th 23° 26' 17" 8

Red. decl	S	23° 26' 49" 77
		B

1864 Dec 22nd (noon) Yet in then town.

Therm. 76 Barom. 29.257

Longitude about 96° 5' E.

Mean refrac. 46°	= 56 63	Obs. alt. O	91 45 30
Therm corr	— 3.05	Index error	— 1 5
Barom. corr	— 1.55		
	<u>52.03</u>		<u>2) 91 42 25</u>
Px. in alt.	— 6.1	Corr of alt.	— 45 51 12.5
Corr. of alt.	45.9		— 45.9
	<u>45</u>	O's Semi-diam	<u>+ 45 50 26.6</u>
E. long	96° 5 = 6 24 20	Zenith dist	46 6 44.0
	— 24	Red. decl.	— 90
G D Dec 21st	17 35 40	True Latitude	20 26 8 ~ 1

Sun's decl. 21st  
, 22nd 23 27 16 0 S  
23 27 38 S (decr)

Daily var (24 h) 13.1 = log 20141

G D Dec. 21st 17 35 40 = log

log 1793 = — 0.6  
Sun's decl. 21st 23 27 16.0

Red. decl

23 27 7.3

Or G D 17 35 40 var 13  
= 9.51  
Sun's decl. 21st 23 27 16.0  
Red. decl. S 23 27 7.1

1861 Dec 24th (noon)

Ye-me-then or Yé-mé-zin

Theim  $78^{\circ}$  Barom 29 33 *Longitude (assumed)*  $96^{\circ} 7' 30''$  E

Mean refiac	$45^{\circ} 50'$	=	$56'' 64$	Obs alt $\odot$	$91^{\circ} 46' 40''$
Theim cori	.	—	3 05	Index error	— 1 5
Barom corr	.	—	1 35		<u>2) 91 45 35</u>
			<u><math>52'' 26</math></u>		
Pv in alt	.	—	6 1		<u>45 52 47 5</u>
Corr of alt	.	—	<u>46 16</u>	Corr of alt	— <u>46 2</u>
				$\odot$ 's Semi-diam	<u>45 52 1 3</u>
				+	<u>16 18 1</u>
E. long $96^{\circ} 7' 30''$	<i>h m s</i>	=	<u>6 24 30</u>		<u>46 8 19 1</u>
			— 24		— 90
G D 23rd (appt time)	<u>17 35 30</u>			Zenith dist.	<u>43 51 40 6 N</u>
				Red decl	<u>23 25 32 0 S.</u>
				<i>True Latitude</i>	<u><u>20° 26' 8'' 6 N</u></u>

O's decl 23rd	$23^{\circ} 26' 22'' 5$ S	G D 17 35 30 var	$1' 9'' 7$
„ „ 24th	$23 25 12 8$ S	„ „ „	$1' = 43'' 7$
Daily var	.. $1' 9'' 7$	(deci) „ „ „	$9'' 7 = 6 56$
			2
		Sun's decl 23rd	<u><u>50 46</u></u>
			<u><u><math>28^{\circ} 26' 22 5</math></u></u>
		Red decl	<u><u><math>23^{\circ} 25' 32'' 04</math></u></u> S

1884 December 28th (noon) Yester'day or To-day in  
Therm. 75 An Th 77° (mean 76°) Longitude (assumed) 96° T 30 E  
Bar (c) 29.328 (d) 29.279 (mean 300)

Mean refrac. at 46	= 56° 3	Obs. Alt.	<u>0</u> 92 4 0*
Therm corr	= 3.05	Index error	<u>—</u> 1 0
Barom. corr	= 1.35		<u>—</u>
	<u>51.9</u>		<u>3.92</u> 2 55
Pr. in alt. 46	= 6.0		<u>—</u> 46 1 27.5
Corr of alt.	<u>45.9</u>	Corr of alt.	<u>—</u> 1.0
	<u>—</u>		<u>—</u>
E long 96° 7' 30" = 6 21 80	<u>—</u> 21	Semi-diast.	<u>—</u> 46 0 41.6
			<u>+</u> 16 15.2
			<u>—</u> 16 16 59.8
			<u>—</u> 00
G D 27th Decr	<u>17 35 30</u> (appd.)	Zenith dist.	<u>43 43 02.3</u>
		Red decd	<u>S 23 16 40.35</u>
O s decl. 27th	<u>23 18' 54.1</u>	<u>True Latitude</u>	<u>N 20 26' 19.84</u>
28th	<u>23 15 51.8</u> (dece.)		
Daily var	<u>3 25</u>		
G D	<u>17 35 30</u> var	<u>3 2° 5 x 2° 13' 75</u>	
	<u>1349</u>	<u>+ log 8971 = 10320</u>	
Log	<u>2.1 71</u>	<u>2.9000</u>	
			<u>Sun's decl 27th 23 18° 24' 7"</u>
			<u>23 16 40 35</u>
		Red decd	<u>—</u>

Xure.—"There might have been ten or twenty seconds added to the Obs. alt. and this would bring the result nearer the previous observations.—Thus:—  
By J. D.

99 150  
1 5

219-313

48 1 3, 5

46 9 110

43 17 98

100

20 10 40 3

True Latitude. 72° 0' S.

1865 January 4th Tsindoung-kee Tsu (‘foot of Elephant hill’)

Therm 66° Barom 27 in.      *Longitude (assumed)* . . 96° 35' E.

Mean refrac	16	=	56"3	Obs. alt. $\odot$	..	92° 2' 0'
Therm corr			19	Index error	—	1 5
Barom corr.			61		—	
			—	2) 92	0	55
P <sub>0</sub> in alt 46°			45 3		16	0 27 5
			— 61	Corr. of alt	—	16 2
Corr. of alt			42 2		—	
			—	45 59	41 3	
E long. 96° 35' =			h m s	Semi-diam	+	16 18 2
			6 26 20		—	
			— 24	True alt $\odot$	—	46 15 59 5
G D Jan. 3rd			17 33 10		—	90
			—	Zenith dist	...	13 44 0 5 N.
				Red decl	—	22 43 18 5 S.
				True Latitude	—	21° 0' 12" N.

Sun's decl 3rd S. 22° 47' 52" 8

" " 4th S. 22 41 37 0

Daily var (24 h) dec 6 15 8 = log .5843

G. D. 3rd 17 33 40 = " .1356

log. 7199 = - 1 31 3

Sun's decl. 31d 22 47 52 8

Red decl S 22 43 18 5

\* N. & S. high the observations have been taken at a little distance from the sun (true) as I found

1865 January 5th (noon) Summit of Trindosang-gyce

Therm 52 Barom. 24.6

Longitude (assumed) 96° 30' E

Mean refe. at 6°30 = 55 35

Therm. corr — 35

Bar corr (about) — 10 0

45 10

Pr. at 46 30 = 5 97

Corr of alt. 30° 13

30° 13

E. long 96° 35' = 6 26°

— 24

G D Jany 4th 17 33 40

Obs. alt. O 93 14 40

Index error — 1 5

2/93 13 35

Corr of alt. — 46 36 47°

30 13

46 36 8 37

18 18 2

46 52 26 57

— 90

43 7 33 43 N

22 36 42 5 S

True Latitude 20 30° 03 N

O s decl. Jan. 4th 22 41 37 0

5th 23 34 54 3

Daily var (24h.) decl 6 42 7 = log 5561

G D Jan. 4th 17 33 40 = log 1356

log 6507 — 4 4 5

O s decl. Jan 4th 22 41 37 0

Red decl S 22 36 12 0

1865 January 6th (noon) Toung-hla village Shan States.

Therm (about)  $60^{\circ}$  Barom 25 65 Long. (assumed)  $96^{\circ} 40' E.$

Mean refraec 46 10	=	$55'' 02$	Obs alt $\odot$	..	$93^{\circ} 25' 25''$
Therm corr	=	1 16	Index error	—	1 5
Bar. corr. (about)	=	8 0		2)	$93^{\circ} 24' 20''$
		$\underline{45 86}$			$16^{\circ} 12' 10''$
Pv. at 46 10	=	6 04	Corr of alt	—	$39^{\circ} 8$
Corr. of alt	=	$39^{\circ} 82$			$46^{\circ} 41' 30.2$
		$\underline{\underline{39^{\circ} 82}}$	Semi diam	+	$16^{\circ} 18' 2$
E long $96^{\circ} 40' =$	$h \ m. \ s$	$6^{\circ} 26' 40''$	True alt	...	$16^{\circ} 57' 18.4$
		$\underline{24}$		—	90
G. D Jan, 5th ..	$\underline{\underline{17^{\circ} 33' 20''}}$		Zenith dist.	..	$43^{\circ} 2' 11.6 N.$
			Red. dec.	..	$22^{\circ} 29' 10.1 S.$
			True Latitude		$20^{\circ} 32' 31.5 N.$

Sun's decl 5th ..  $22^{\circ} 34' 54'' 3 S$   
 " " 6th ..  $22^{\circ} 27' 44.8 S$  (deer)

Daily var (24 h.)  $0^{\circ} 7' 9.5 = \log.$  5254

G. D. Jan, 5th...  $17^{\circ} 33' 20'' = \log.$  1358

$\log \underline{\underline{6612}} = - 5 14^{\circ} 2$

Sun's decl Jan 5th  $22^{\circ} 34' 54.3$

Red. decl S  $22^{\circ} 29' 10.1$

1865 January 11th (noon.) Kyouk-tat

Therm. 69 5 Barom. 23 7 m. Longitude (assumed) 96 10 F

Mean refrac 47 5 =	54° 25'	Obs. Alt. $\odot$	94 11 55
Therm. corr	2 35	Index error	— 1 5
Barom corr (about)	7 00		<u>2) 94 10 50</u>
	<u>44 00</u>		<u>47 5 25</u>
Plx. at 47	5 93	Corr of Alt.	— 38 07
Corr of Alt.	38 97		<u>47 4 46 03</u>
	<u>—</u>	Semi diam.	+ 16 17 0
E. long	96 45 = 6 27 0		47 21 3 93
	— 24		— 00
G D Jany 10th	17 33 0	Zenith dist	42° 38' 56" 07 N
	<u>—</u>	Red. decl.	21 47 51 0 S
$\odot$ 's decl., 10th	21 54 43 5	True Latitude	20 51 2 0 V
, , 11th	21 45 23 0 (decr)		<u>—</u>
Daily var in 24 h.	0 9° 10' 9" (decr) = log	4103	<u>—</u>
G D 10th	17 33	= log	1350
	<u>—</u>	log	3161 = 6° 43' 3
		Sun's decl 10th	21 54 43 0
		Red decl	21 47 51 0 S

Or *From Paper (Table 21.) 5 p. 190*

G D 10th	17 33	var 9 19° 9'	
	17 30	9' = 6° 33' 7"	
	3	9' = 1 21	
	17 30	20' = 14 9	
	3	20' = 0	
		<u>6 30 4</u>	
		Sun's decl 10th	21 54 43 0
		Red. decl	21 47 51 0 S

1865 January 18th ( † ) Mine-byu Town

Therm.  $70^{\circ}$  Barom. 271Long. (assumed)  $96^{\circ} 45' E$ 

Mean refrac $48^{\circ}$	=	52 <sup>o</sup> 6	Obs alt $\odot$	$96^{\circ} 1' 30'$
Therm corr	.	2 0	Index error	$1 5$
Barom. (about)	.	4 1		
		<u>16 2</u>		<u>2) 96 0 25</u>
Plx. in alt. $48^{\circ}$		<u>5 7</u>	Corr of alt.	$48 0 12 5$
Corr of alt.		<u>10 5</u>	$\odot$ 's Semi-diam.	$17 59 32 0$
		<u><u>10 5</u></u>		<u>16 17 4</u>
				<u><u>18 15 49 4</u></u>
E. long $96^{\circ} 15'$	=	<u>6 27 0</u>		<u>— 90</u>
		<u>— 2 1</u>	Zenith dist.	$41 44 10 6$
G D. 17th Jany.		<u>17 33 0</u>	Red decl.	$20 31 17 4$
			Latitude	$21^{\circ} 12' 23' 2$
				<u><u>—</u></u>

$$\odot$$
's decl 17th S  $20^{\circ} 10' 12'' 1$   
 " 18th S  $20 28 30 8$ 

$$\text{Daily var. (24 h)} \quad \frac{12' 11'' 3}{G D \quad 17 \quad 33} = \log. \quad 2913$$

$$\log \frac{1302}{\text{Sun's decl. 17th}} = - S' 54' 7$$

$$20^{\circ} 10' 12'' 1$$

$$\text{Red decl.} \quad S \quad 20^{\circ} 31' 17' 4$$

† The observations were taken at noon the 17th and 18th inst. but the sun was not visible on the 18th (My Chinese teacher has informed me that it was)

1865 Jany 10th (noon) Pan-saw Tm 6 or 7 miles E of Mine-byin

Therm. 76° Barom. 26.7 Long (assumed about) 90° 50'

Mean refrac. at 48	10 = 53° 3
Therm. corr	2 5
Barom. corr.	5 7
	44 1
Plx. at 48	5 7
Corr. of alt.	38 4
	4 1
E. long 96 50 = 6 27 20	
	— 24

G D 18th Jan. 17 32 40

Obs. alt. $\odot$	96 35 35°
Index error	— 1 5
	2) 96 34 30
	48 17 15
Corr. of alt.	— 38 4
	48 16 36 6
Semi-diam.	+ 16 17 4
	48 32 44 0
	— 90
	41 27 6
Red. decl. $S$	20 10 10
True lat. $N$	21 7 17

$\odot$ 's decl 18th S	20° 28' 30" 8
" " 19th S	20 15 56 3 (decr)
Daily var (24h)	12 31 5 = log 2807
G D 18th	17 32 40 = log 1300
	log 4167 = 9° 11" 8
Sun's decl 18th	20 28 30 3
Red. decl. S	20 19' 10" 0

1865 January 21st (noon.) Tsukahn among hills, beyond Nattit.

Therm 68° or 69° Barom 25.58. *Longitude (assumed) 97° 15' 0" E.*

Mean refra. at 48°30' = 51" 6	Obs Alt $\odot$	97° 15' 10'
Therm. corr. — 2.00	Index error —	1 5
Barom. (about) — 8.		<u>2) 97 14 5</u>
		48 37 25
Plx. in alt. 48°30' — 41.60	Corr of Alt. —	36.0
— 5.6		<u>18 36 26.5</u>
Corr of alt. — 36.0	Semi-diam +	16 17.2
		<u>48 52 13.7</u>
E long 97° 15' = <u>h m s</u> — 6 29 0	—	90
		<u>—</u>
G. D. 20th — 17 31 0	Zenith dist $N.$	41 7 16.3
	Red decl $S$	19 51 7 15
	<i>True latitude N</i>	<u>21° 13' 09' 15</u>

$\odot$ 's decl 20th  $S$  20° 2' 58" 9  
" " 21st  $S$  19 19 39.0 (deer)

Diffee. (24 h)  $13' 29' 1 = \log. 2499$

G. D. Jany, 20th  $17 31 = \log 1363$

$\log 3862 = -8 51 75$

Sun's decl. 20th Jany  $20 2 58 9$

Red. decl.  $19 51 7 15$

1865 January 24th (noon) At breakfast place before reaching Lédečká

Therm 69 Barom 26.4 (Att. Therm. 71.8)

Longitude (assumed about) 07° 26' E.

Mean refrac. 49 16	=	50° 40	Obs alt. O	08° 33' 10"
Therm (70°) corr	-	2 00	Index error	— 1 5
Barom. (about)	-	6 00		—
		42 4		2) 98 32 5
Plx. in alt. 50	-	5 6		—
Corr of alt		36 8	Corr of alt.	49 16 25
		—		— 36 8
E long 97° 28'	=	8 29' 44	Semi-diam.	49 15 25 7
	-	24		+ 16 10 9
G D 23rd		17 30 16		—
		—		10 31 12 6
		—		— 00
Zenith dist.				10 28 17 4 N
Red decl				10 11 20 0 S
True latitude				21 16 30 5 N

O's decl. 23rd       $8^{\circ} 10' 21'' 9$   
                  , 24th       $8^{\circ} 10' 7'' 27.5$  (decr.)

Daily var (24 h) 14 25.4 nlog -2213

G D 23rd 17 30 16  $\Rightarrow$  log 1372

$$\log 3595 = -10'31'0$$

Sun's decl. 23rd 10 21 51 9

Red. decl. S 10 11 20'0

1865 January 29th (noon) Lé-déah Mo.

Therm 76° (Alt Th. 78°) Barom (c) 26.67 and (b) 26.72.

Long. (assumed) about 97° 30' E

Mean refiae	50°30' =	18" 15	Obs Alt	101° 7' 55"
Therm. corr	—	2 50	Index error	— 1 5
Barom. (about)	—	6		<hr/>
		39 65	2/	101 6 50
Plx. in alt. 50°30' —	5 0			50 33 25
Corr. of alt	—	34" 65	Corr. of alt	— 34 6
		<hr/>		<hr/>
E long 97° 30 =	<i>h m. s.</i>	6 30 0	Sun's semi-diam.	50 32 50 1
— 24			+	16 16 2
G. D. Jany 28th	17 30 0			<hr/>
			50 19 0 6	<hr/>
			— 90	<hr/>
Sun's decl 28th	<i>S</i>	18° 6' 19" 5	N. 39 10 53 4	<hr/>
„ „ 29th	<i>S</i>	17 50 13' 0	S 17 51 35 0	<hr/>
Daily var. (24 h)	—	16 6.5	True latitude	N. 21° 16' 18" 1
		<hr/>		<hr/>

Sun's decl 28th *S* 18° 6' 19" 5„ „ 29th *S* 17 50 13' 0Daily var. (24 h) 

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 16 6.5 (dec)

G. D. 28th 17 30 = log 17.52

= log .1372

log. 

---

 3104 = — 11' 17" 5

Sun's decl Jany. 25th 18° 6' 19" 5

Red. decl *S* 

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 17 51 35 0

Li-deau.—18° 20' 50" north of Lat. 21°

1865, January 30th (noon) At Pan Lan village north of Lé-déuk

Therm. 77 7 Barom. 26 5 Longitude, (assumed) 97 30' E

Mean refrac. at 50 40	=	47 88	Obs. alt. O	101° 25' 10"
Therm. corr	-	2 7	Index error	1 5
Barom. (about)	-	5 18		
		40 00		2) 101 24 5
Plx. at 50 40	-	5 0		
Corr of alt.	=	35 00	Corr of alt	50 42 2 5
				35 0
				50 41 27 5
			Semi-diam	+ 16 16 1
E long 97 30' =	h m s	0 30 0	True alt. O	50 07 43 0
—24				— 00
G D 29th	<u>17 30 0</u>		Zenith dist.	30 26 4
			Red. decl.	S. 17 38 14 5
			True Latitude N	<u>21 21, 1 9</u>

O's decl 29th 17 50' 13" 0  
" " 30th 17 33 47 4

Daily var (244) 16 25 6 = log 1047

G D 29th 17 30 = " 1372  
" 30th = 3019 = — 11 58' 5

Sun's decl. 29th 17 50 13 0

Red. decl 17 35 14 5

1865, February 1st (noon) Camp  $\frac{3}{4}$  mile N. E. of Muie-kie Mts

Therm. 68° Barom. 26.4 Long (assumed about) 97° 25' E

Mean refrac	51°	=	47.3	Obs. alt. ○	102°	5' 25"
Therm. corr	—	18		Index error	—	1 5
Barom (about)	—	55				
			10 0			
Plx in alt. 50°	—	56			29102	4 20
Corr. of alt	—	31 4				
			—			
			h m s			
E long 97° 25'	=	6 29 10	○'s semi-diam. +	51 1 35 6		
— 24				16 15 8		
G D Jany. 31st	17 30 20		True alt. ○	51 17 51 4		
			—	90		
Zenith dist ○	38 12 8 6 N					
Red. decl.	17 1 38 0 S.					
True latitude.	21° 37' 30" 6 N					

Sun's decl. Jany 31st 17° 17' 3' 3  
" Feby 1st 17 0 0 9 (dec)

	17 24	=	log .1483
G. D. Jany. 31st	17 30 20	-	log .1372
"	1860		— 12 25 3
Sun's decl Jany 31st	17 17 3 3		
Red. decl. S	17 1 38 0		

1860, February 4th (noon) Camp near Nah mong

Therm. 70 Barom 26.19

Long (assumed) about 97° 30' E.  
or 97° 28'

Mean refrac. at 51° 40' = 46.2	Obs. alt. O	103 20 40
Therm. corr	Index error	— 1 5
Barom. (about)	—	—
	38 2	2/103 21 10
Plx. in alt. 50	— 5 6	—
Corr of alt.	— 32 6	51 42 20
	—	32 6

E. long 97° 30' =	6 30 0	Semi-diam.
— 21	—	51 41 47 1
G D Feby 3rd.	17 30 0	— 16 13 8
	—	—
	—	51 58 32
	— 00	—

Zenith dist.	38 1 50 8 V
Red. decl.	16 12' 0" S.
True Latitude	21 10' 56" V
	—

Sun's decl Feb 3rd	16° 20' 33"
," , , 4th	16° 7' 88" (dec.)

Daily var (24h)	17 54 5 = log 1272
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G D Feb 3rd.	17 30 = , 1373
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," 2644 = —	13 3 3
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Sun's decl Feb 3rd	16 25 33"
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Red. decl.	S 16 12' 0 0"
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1865, February 8th (? after noon) Heatone Bazaar, south of Ullage

Therm.  $71^{\circ}$  Barom. 26.6Long. (assumed)  $97^{\circ} 45' E.$ 

Mean refraic $53^{\circ} = 41.0$	Obs alt $\odot$	$106^{\circ} 7' 0'$
Therm. corr — 2.3	Index error	— 1 5
Barom (about) — 5.0		<hr/>
	2) 106	5 55
		<hr/>
Plx. in alt $53^{\circ} = 5.6$		$53^{\circ} 2' 57.5$
		— 31.1
Corr. of alt 31.1		<hr/>
— " —		$53^{\circ} 2' 26.4$
	Semi-diam	— 16 14.6
$E$ long. $97^{\circ} 45' = 6^{\text{h}} 31' 0$		<hr/>
— 24		$53^{\circ} 18' 11.0$
G D Feby 7th $17^{\text{h}} 29' 0$		— 90
		<hr/>
	Red. decl.	$N$ $36^{\circ} 41' 19.0$
		$S$ $14^{\circ} 57' 55.6$
		<hr/>
	Latitude	$N$ $21^{\circ} 13' 20' 4'$
		<hr/>

Obs decl Feby 7th  $15^{\circ} 11' 47'' 6$   
 " " " 8th  $14^{\circ} 52' 19' 1$  (dec.)

Daily var (24h)  $15^{\circ} 58' 2$  = log 1022G D Feby 7th  $17^{\text{h}} 29'$  = log 1376 $\log \frac{1376}{1022} = -1.793$ Sun's decl Feby 7th  $15^{\circ} 11' 47''$ Red. decl  $S$   $14^{\circ} 57' 55.6$

1805, February 10th (noon.) Camp near Kain-loon

Therm. 80 Barom. 271

Long (assumed about) 97° 50' E

Mean refrac. 53° 20, =	43° 4	Obs. alt. $\odot$	106 50' 10
Therm corr	— 2.0	Index error	— 1 3
Barom. corr	— 4		
	<u>36.5</u>		<u>2)106 40 5</u>
Plx. in alt. 50	— 5.5		53 24 32.5
Corr of alt	<u>31.0</u>	Corr of alt	— 31.0
	<u><u>31.0</u></u>		
			53 24 1.5
E. long 97° 50' =	<u><u>6 31 20</u></u>	$\odot$ 's Semi-diam. +	18 14.2
	<u>— 24</u>		
G D Feb 9th	<u>17 28 40</u>		
		Zenith dist.	<u>N</u> 30 10 44.3
		Red. decl.	<u>S</u> 14 10 2.9
		True Latitude	<u>N</u> 22 0' 18.4

Sun's decl Feb 9th 14 33' 36 1  
, " 10th 14 14 8 4 (decr)Daily var (24h) 10 27 7 = log 0911G D Feb 9th 17 28 10 = log 1377log 2288 = — 14 10 2

Sun's decl Feb 9th 14 33 36 1

Red. decl. S. 14 10 2.9

1865, February 15th (noon) Camp in large Kjung Coop N. of Osteros

Therm. 76° Barom 27.2 Long. (assumed above) 97° 38' E.

Mean refra	.. 54° 30' =	41 6	Obs alt $\odot$	.. 109° 3' 10'
Therm. corr	..	— 2 5	Index error	— 1 5
Barom. about	..	— 1		—
		35 1		2) 109 2 5
Plx. in alt 51°	..	— 5 0		54 31 2 5
Corr. of alt.	..	30 1	Corr. of alt	— 30 1
		—		
			h m. s	54 30 32 4
E. long	.. 97° 30' =	6 30 32	Semi-diam.	— 16 13 2
		— 21		54 16 35 6
G. D. Feby 14th	17 29 28		— 90	—
			Red. decl S.	35 13 14 4
				— 12 39 0 1
			True Latitude	.. 22 34 11 3

Sun's decl. Feby 14th 12° 51' 0.1  
" " 15th 12° 33' 25.7 (decr)

Daily var. (24 h) 20 34 4 = log 0.69

G. Date Feb 14th 17 29 28 = log 1372

log 2041 = -15 0 0

Sun's decl. 14th 12° 51' 0.1

Red. M. 14th 12° 33' 25.7

1865, February 20th, (noon) Camp at La-shoo

Therm. 76° Barom. 27.3

Long (assumed about) 97° 30' E

Mean refrac.	55 50	=	39° 65	Obs alt. <u>O</u>	111 47 50
Therm. corr	— 2° 15			Index error	— 1 5
Barom. corr	— 3 45				
			34° 05		2) 111 46° 15
Fix in alt. 55 50°	— 4 95				
Corr of alt.	20° 10			Corr of alt.	— 29 1
E long	97 30	=	6 30 0	Sun's semi-diam.	55 52° 53' 4
	— 24				+ 16° 12' 2
G D 19th	17 30 0				56° 9' 5 6
					— 90°
Zenith dist.	<u>A</u>				33 30' 54 1
Red. decl.	<u>S</u>				10 33' 20 3
True Latitude	<u>N</u>				22° 57' 20 1

Sun's decl 19th S. 11 9' 10" 8  
 " 20th S. 10 47 30 8 (decr)

Daily var (24 h) 21 31 0 = log 0.174

G D 19th 17 30 = log 1.372

log 1816 = — 10 41 5  
 Sun's decl. 19th 11 9' 10" 8  
 Red. decl. S 10 33' 20" 3

1865, March 1st (noon) Camp near stark.d at Lévis

Therm 80°	Barom 27.35	Long foun and abo 97° 30' E.
Mean refrac 59° 12' = 35' 33	Obs alt Q	118° 26' 15
Therm corr = 2.10	Index error	1 5
Barom corr. = 2.90		
		2/118° 25' 10'
Ply at 60° = 1' 3		
		59° 12' 35'
26' 03	Corr. of alt	26'
		59° 12' 9
	Semi-diam.	16° 10' 1
E long 97° 30' = 6 30 0	True alt. O	59° 28' 19' 1
= 24		90°
G. D. Feb 28th 17 30 0	Zenith dist N	30° 41' 10' 9
	Red decl S	7° 33' 29' 1
	True Latitude N	22° 55' 11' 8

Sun's decl Feb 28th 7° 50' 5' 1  
 " " Mar 1st 7° 27' 18' 7 (decr.)

Daly var (24 h) 22 46' 4 = log. 0229

G. D. Feb 28th 17 30 = log 1372

log 1601 = 4 16 46 0  
 Sun's decl. Feb 28th 7° 50' 5' 1

Red decl. S 7° 33' 29' 1

1865, March 2nd, (noon) *La-sheoo* *Camp near stockade*Therm. 80 Barom. 27 34 *Longitude (assumed) 97 30' E*

Mean refrac.	59 30 = 34 4	Obs. alt. O	110 12' 0"
'Therm corr	— 2 1	Index error	— 1 5
Barom. corr	— 2 9		
	<u>29' 4</u>		<u>2) 110 10 55</u>
Plx. in alt. 80	— 4' 3		
	<u>25 1</u>	Corr of alt.	<u>59 35 27 3</u>
			<u>— 25 1</u>
		Semi-diam.	<u>+ 59 35 2 1</u>
			<u>16 19 9</u>
E. longitude 97 30' =	<u>8 30 0</u>		50 51 12 3
	<u>— 24</u>		<u>— 90</u>
G D March 1st	<u>17 30 0</u>	Red. decl.	<u>N 30 8 17 7</u>
			<u>S 7 10 38 2</u>
		True Latitude	<u>N 22 58 0 0</u>

Sun's decl March 1st 7 27 18' 7  
" " " 2nd 7 4 20 1 (decr)Daily var (24 h.) 22 52 6 = log 0200G D March 1st 17 30 = log 1372log 1381 = - 16' 10" s  
Sun's decl March 1st 7 27 18 7Red decl S 7 10' 35 2

La-sheoo.—2 MILES SOUTH OF LATITUDE 30

1865, February 25th, (noon?) Camp at Mine-Yaw

Therm.  $76^{\circ}$  Barom  $27.1$

Longitude (assumed)  $97^{\circ} 50' E.$

Mean refrac at $57^{\circ} 30'$	$= 37'' 2$	Obs alt $\odot$	$115^{\circ} 18' 30''$
Therm corr	$- 1'' 8$	Index error	$- 1 5$
Barom corr	$- 3'' 3$		
	$\underline{32'' 1}$		$2) 115 17 25$
Plx in alt	$- 4'' 3$		$57 38 42 5$
Corr of alt	$\dots 27'' 8$	Corr of alt	$- 27 8$
	$\underline{\underline{27'' 8}}$		
		Semi-diam.	$57 38 14 7$
			$+ 16 11 0$
E long $97^{\circ} 50'$	$\begin{array}{l} h \ m \ s \\ = 6 \ 31 \ 20 \\ - 24 \end{array}$		$57 54 25 7$
			$- 90$
G D Feby 24th	$\underline{\underline{17 28 40}}$	Zenith dist.	$32 5 34 3 N.$
		Red. decl	$S. 9 3 45 8$
		True Latitude	$N. 23^{\circ} 1' 48'' 5^*$
			$\underline{\underline{\underline{5^*}}}$

Sun's decl Feby 24th  $9^{\circ} 19' 59'' 3$   
 " " 25th  $8 57 42 2$  (dec<sub>1</sub>)

Daily var (24 h)  $22 17 1 = \log .0322$

G D Feby 24th  $17 28 40 = \log \underline{1378}$

$\log 1700 = - 16' 13'' 5$

Sun's decl 24th  $9^{\circ} 19' 59'' 3$

Red. decl S  $9^{\circ} 3' 45'' 8$

\* If a little after noon, apparent time, the latitude resulting will be higher than the true latitude

1865, February 27th, (noon) *Lor-éat, hill E. of Miso-Yar*

Therm. 72 (or little less.) Barom. 25.4 Long (assumed about) 08 0' E

Mean refrac. 58 25 = 36° 00	Obs alt. $\odot$	116° 50' 30
Therm. corr	— 1 5	— 1 5
Barom. corr (about)	4° 0	2) 116° 49' 25
		3) 58 24 48 2
Plx. in alt. 60	— 4 3	— 20 2
Corr of alt.	20° 2	58 24 16 3
	—	16' 10 6
		58 10' 26" 9
		— 00
		31 10' 33 1
	Red decl.	S 8 15 12 7
	True Latitude	λ 23 0' 50 4
East long 08	<i>h m. s</i> = 8 32 0	
	— 24	
G D Feby 26th	— 17 28 0	
Sun's decl Feby 26th	8 35 17 2	
27th	8 12 41' 7 (decr)	
Daily var (24 h.)	22 32 5 = log	0.273
G D Feby 20th 17 28	= log	1380
	log	16.3 = — 16 24 4
Sun's decl Feby 26th	8 35 17 2	
Red. decl	8.5 15 12 7	

HIGHEST LATITUDE ATTAIN'D

1865 March 7th, (noon.) Banzé Myo Lowest ground in the Shan States.

Therm.  $84^{\circ}$  (Att Therm  $80^{\circ}$ )

Barom (c) 28 13 (d) 27 98

Long (assumed about)  $97^{\circ} 38' E.$

Mean refrac	at $61^{\circ} 40'$	= 31" 52	Obs alt $\odot$	$123^{\circ} 23' 20''$
Therm corr	—	2 3	Index error	— 1 5
Barom. corr. ...	—	21 5		
		27 07		2) 123 22 15
Plx in alt $60^{\circ}$	—	4 3		61 41 7.5
Corr. of alt	—	22 77	Corr. of alt	— 22 7
		—		
			Semi-diam.	+ 61 40 44 8
E long	$97^{\circ} 38'$	= 6 30 32	True alt. $\odot$	— 16 8 5
		— 24		61 56 53 3
G D March 6th		17 29 28		— 90
		—	Zenith dist.	28 3 6 7
			Red decl	S 5 15 1 0
			True latitude	N 22° 48' 5" 7
			—	—

Sun's decl March 6th  $5^{\circ} 32' 0'' 5$

„ „ „ 7th  $5 8 42 3$

Daily var (24 h.)  $23 18 2 = \log. 0128$

G D. 17 30 =  $\log 1372$

$\log 1500 = 16' 59'' 5$   
Sun's decl. on 6th  $5^{\circ} 32' 0'' 5$

Red. decl.  $S 5^{\circ} 15' 1'' 0$

1885 March 20th, (noon) Camp at Hotoo Village

Att. Therm. (c) 79 (say 82°)  
Barom. 27.3 and 27.2

Longitude assumed about 98° 20' E

Mean refrac. 67° 30' = 24° 1  
Therm. corr. — 1 6  
Barom. corr. — 2 5Plx. in alt. 70 = — 2 0  
Corr of alt. 16 6Obs. alt. Q — 135° 15' 10"  
Index error — 1 5

2) 135 14 5

Corr of alt. — 67 37 2 5  
16 6

67 36 15 0

Sun's semi-diam. + 16 5 1

67 52 51 0

— 9 0

Zenith dist. 22 7 0 0  
Rel. decl. 8 0 8 2 1 5

True latitude N 21 0 S 14° 5'

Sun's decl. Mar 19th S. 0 25 38 0  
" " " 20th S. 0 1 56 3 (decr.)

Daily var (24h.) 23 41 7 log .00.6

G D Mar 19th 17 27 = log 1350

log 1350 = — 17 13 0

Sun's decl Mar 19th 0 25 35 0

Rel. decl. S. 0 8 2 1 5

1865 March 21st, (G. D.) Co-parallel of Salween River

Rat to (c) 28 sec 28.6

Alt. 1h. 3m. 31 (ay 80)

Longitude of boat 98° 30' E.

Mean sec.	68° 3' 23.0	Ob. alt. O	136° 8' 0"
Index error	± 1.1	Index error	± 1.5
Instrument	± 0.9		
Plt. in alt. 70	21.7		21.6 6.55
	33		
Corr. of alt.	18.1	Corr. of alt. 70	68° 3' 27.5
			18.4

Sundial	68° 3' 9.1
	16.45

E. long. 98° 30'	± 6.34.0		68° 11' 13.9
	± 2.1		69

G. D. March 20th	17° 26' 0"	Z. n. decl. 20th	17° 21' 10" 46.1
		Red. decl.	17° 0' 15" 15.95

Sun's decl. 20th S. 0° 1' 56" 3	Transit 20th 22	N	17° 21' 56" 25.05
" " 21st N. 0° 21' 43" 8			

Var. (21st)	0.23 41.1	$\approx \log$	6058

G. D. March 20th	17° 26'	$\approx \log$	1388

$\log$	1440	$\approx$	17° 12' 25
Sun's decl. 20th S. 0° 1' 56" 30			

Red. decl.	N 0° 15' 15" 95

N. B.—As the Greenwich date is merely assumed, the sun's declination cannot be ascertained very accurately, for in March the sun's declination changes nearly 1° an hour, or 1' in 1 m.

1865 March 23rd, (noon) Camp on bank of Salween River

Att. Therm. (c) 80 7 (say 80°)  
Barom. (c) 28 834 (p) 28 600

, Long assumed 98 30' E.

Mean refrac.	68° 50'	=	22° 6
Therm. corr	—	1° 45	
Barom. corr	—	1° 55	
		—	19° 6
Plx. at 70	—	3 2	
Corr of alt.	—	18° 4	
		—	
E. long 98 30'	—	6 34 0	
	—	24	
G D Mar 21st	17 26 0		

Obs. alt. Q	137	43°	0
Index error	—	1	5
	—	2) 137	41 55
Corr of alt.	—	68° 50' 57	5
	—	16 4	
Semi-diam	—	68 50' 41	1
True alt. O	89	6' 46	4
	—	90	
Zenith dist N	20	53' 14	6
Red. decl. N	1	2' 30	4
True latitude Y	21	35 50	0

Sun's decl. Mar 22nd N 0 45 21 0  
" " " 23rd N 1 9' 3" 5 (incr)

Daily var (24h) 0 23' 35" 6 = log .0065

G D Mar 22nd 17 26 = log 1388

log 1453 = + 17 10°.

Sun's decl. Mar 22nd 0 15 24 1

Red. decl. N 1 2' 35 4

This is the last day that the Sextant can be used in these Latitude for meridian observations.

(Signed) F. FREDRICK,  
Geological Survey,  
British Bureau

